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Contractor Performance Measurement:

Overrun Contracts

With Selected
Comments on
Problems of
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CONTRACTOR PERFORMANCE MEASUREMENT: OVERRUN CONTRACTS

With Selected Comments On
Problems of
Implementation of the C/SCSC

by

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Submitted
to the Faculty of
the Harvard Business School
in partial fulfillment of the requirements for
the degree of
Master in Business Administration
Harvard University
Graduate School of Business Administration
April, 1973

ACKNOWLEDGEMENTS

This research was made possible by the financial assistance provided by the Defense Systems Management School. We express our thanks to the Commandant, Brigadier General Winfield Scott, and the Director of Research, Mr. Thomas Keegan.

To Dr. J. Ronald Fox we extend our special gratitude. He took time from a demanding business venture to assist us in this endeavor; we appreciated his guidance.

Sincere appreciation is also extended to the contractor managers at the eight facilities we visited. Their anonymity precludes any formal recognition, however they can be assured that their input was well received.

PREFACE

This research was accomplished from the point of view of a Defense contractor. It is expressly bias toward contractor objectives. The attempt was to show how the contractor needed additional information to control his program and explain why the Government should use that information.

This study has at least two major limitations. The most important limitation is the sample size. We interviewed in eight contractor facilities. Some of those contractors didn't fully appreciate our "objective" position nor were they willing to completely divulge control procedures. (This is an area of considerable debate, and much concern in and outside the Department of Defense.) We are sure that some of the perceived reluctance was more a problem of communication than distrust.

The second limitation was time. This study was accomplished in a relatively short period of time which necessitated shortened interviews in some cases.

Despite the limitations we feel this research presents fairly some problems, and recommendations for Contractor Performance Measurement.

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SUMMARY

This paper explains the present use of the performance measurement baseline, and provides an alternative use that has limited acceptance. In addition, comments have been provided regarding the feasibility of future C/SCSC application to shipbuilding.

It is important to emphasize the fact that the authors are in complete agreement with the present Cost/Schedule Control Systems Criteria. The problem that we explain in this paper is an exception to the general use of the criteria; an exception that is acceptable as the criteria is presently written, and is in use by at least one contractor.

The criteria, as it is presently implemented, provides the contractor and the Government the vehicle to insure detailed planning in an understandable, efficient manner.

It is our opinion that the information, based on original budget estimates, generated to meet Government reporting requirements, is meaningful for only as long as the contractor continues to use internal budgets that sum to the original contractual estimate or contract target cost. If the contract is in an overrun status and the Government reports are based on old budgets that have no resemblance to the internal budgets used by the contractor, then the reports are comparing costs that have no realistic basis.

CONCLUSION

The internal budgets should be used for reporting purposes after the budgets are formally recognized by both the contractor and the Government. This is acceptable as the criteria is presently written. The objective of the C/SCSC is to provide an adequate basis for responsible decision making by both contractor management and DOD Components. It is our contention that the basis for responsible decision making is the knowledge of the contractor's new estimated cost at completion. Each smaller budget that makes up that new estimate at completion has a similar new estimate. (We are assuming these estimates are made on some realistic basis. In some instances the new estimates are a mathematical projection of costs to date. This situation would not be acceptable for use with a revised reporting base). The information necessary for decision making is based on how the contractor is performing to the new estimate. The original budgets are ancient history. The Government should be interested in how accurate the new estimate is.

In essence we are advocating changing the baseline whenever the contractor and the Government manager (Program Manager) agree that the old baseline is out of date; variance analysis should be done on the new baseline. If there is no variance initially (which one would suspect) then both managers agree on the new estimate. The agreement and knowledge of the new estimate is the key to responsible decision making.

It is also essential that the original estimate, the estimate

that is called contract target cost, should be visible, and kept available for the decision maker that must consider cost growth... and terminating the program. This decision maker must look at the latest estimate (which one can be assured is closer to the final cost than the original estimate) and compare it to the original estimate and decide if the program is still cost effective. If the decision maker is presently looking at the variance from the original budget rather than the estimated cost at completion (realizing this is an overrun situation), that decision maker is going to be misled. The variance is an indication of how the contractor is performing to his budget. If he has already stated that the original budget is not accurate, the Government might as well recognize the changes from the original budget. No one is surprised that an unfavorable variance exists.

In our opinion the criteria is designed to assure the Government has the information necessary to make decisions. Maintaining old budgets doesn't provide this information. If the new estimates are acceptable, visible, and realistic, let the contractor change his budgets at his discretion...as long as the Government is informed, and agrees. At that point, the point where the contractor re-estimates his budget, is where the program office should be making Cost/Schedule/Technical tradeoffs.

We have heard the argument that if you allow the contractor to change his budget, you cannot control the contract. Our research has indicated that the person that controls cost recoverable contracts is the contractor. All the Government can do is monitor the progress, and make tradeoff decisions if the costs become excessive.

This baseline change has been accomplished in at least one contractor facility that we visited. It was done with the concurrence and support of the Government Program Office. We encourage this activity in all situations experiencing a contract target cost overrun.

C/SCSC IN SHIPYARDS

We are of the opinion that C/SCSC can be implemented at the major shipyards. We found there to be some unique problems involved with implementation as a result of the estimating process and work breakdown structure (WBS) required by NAVSHIPS. The estimating and bidding system is based on the Bureau of Ships Consolidated Index (BSCI), a system concept, while ship construction and budgeting are based on a unit or modular concept.

The Navy should begin to develop a work breakdown structure for ships which corresponds with the way ships are constructed.

CHAPTER I

OBJECTIVE OF PERFORMANCE MEASUREMENT

BACKGROUND

The Assistant Secretary of Defense (Comptroller) signed an instruction numbered 7000.2 on April 25, 1972 that updated the criteria for "Performance Measurement for Selected Acquisitions". This Department of Defense Instruction (DODI) is designed to require management information in order to provide an adequate basis for responsible decision making by both contractor management and DOD Components. Contractors' internal management control systems must provide data which (1) indicate work progress, (2) properly relate cost, schedule and technical accomplishment, (3) are valid, timely and auditable, and (4) supply DOD managers with information at a practicable level of summarization.¹ This chapter will explain some of the reasons for the Instruction and provide some thoughts about reporting performance measurement. In addition, a new idea about program status will be introduced.

THE COST/SCHEDULE CONTROL SYSTEMS CRITERIA (C/SCSC)

The C/SCSC is applied only to selected contractors. The criteria is applied to cost recoverable contracts and contracts with incentive provisions. These contractors are required to have control systems in order to report cost problems before those problems are irreconcilable and the procuring agency has no

¹Department of Defense Instruction 7000.2, Performance Measurement for Selected Acquisitions, Washington, D.C., April 25, 1972.

alternative but to fund the projected cost overrun. The contractor's internal control system is required to meet the elements of the criteria. The requirement is in the form of a criteria to preclude a rigid interpretation by the services who are tasked with its implementation. A complete description of the criteria will be provided in Chapter II.

In order to provide this early visibility of problems the criteria requires a planning discipline that allows budgets to be identified to unique work elements. This simple discipline has not always existed. "As one individual stated: "We have problems getting them (engineers) to budget for packages of work a week or two ahead to say nothing of planning six months ahead!"²(The criteria requires that work elements be planned in detail for at least six months into the future.)

The internal control system must be evaluated by a government team to assure that the control system meets the minimum requirements of the criteria. The minimum reporting requirements include the budgeted value of the work currently in process, and the percentage of the work that has been completed expressed as a dollar value of work accomplished. The internal cost accounting system must provide the actual expenditures to date. These three dollar figures should provide the information necessary for early warning of difficulties. This minimum information is essential for controlling a project. However...many contractors failed the evaluation initially. "The primary reason for failing the evaluation was the inability of the contractor to establish and

²J. Ronald Fox, Working Papers Contractor Performance Measurement (Harvard Business School, 1972) p. 33.

maintain a valid measurement baseline."^{3,4}

The authors contend that the basic reason for the criteria is to provide this needed visibility into the planning and accomplishment of the tasks outlined in the contract, while keeping abreast of the costs associated with accomplishing those tasks. At least one government manager agrees "the reason behind all of the individual requirements in C/SCSC is to allow the comparison of actual costs to a meaningful plan which is representative of the contractual commitment..."⁵

It is worth mentioning that all government managers do not agree on the value or validity of the Cost/Schedule Control Systems Criteria. One government project manager that has been quoted in an internal contractor publication has stated that the contractor should not be too concerned with the C/SCSC because good open management is essential for control, not a set of superimposed criteria.

COST PERFORMANCE

J. Ronald Fox in some of his research has stated that the "term cost performance or contractor cost performance is usually misinterpreted by Government program management personnel to mean no more than an appraisal of whether funds were being spent on the program too fast or too slow in terms of calendar time periods."⁶

³Robert R. Kemps, Maj. USAF, Contractor Performance Measurement (Defense Industry Bulletin, Summer 1971), p. 45.

⁴The planned budgets added together form a line that is called the performance measurement baseline.

⁵Kemps, Contractor Performance Measurement, p. 44.

⁶Fox, Contractor Performance Measurement, p. 17.

Our research has indicated much the same response when the question of government use of data was raised.⁷ The available output is in the form of the Cost Performance Report (CPR), and there was some question by the contractors we visited if the output is used. In some comparable research by LTC Len Marrella he found that "two of the contractors (he researched eight) were convinced that the government managers did not even read the Cost Performance Reports".⁸

While an Assistant Secretary of the Army, Fox said this to all Army Program Managers:

"the key to early visibility of cost overruns is tracking the actual cost of work performed and comparing it frequently (at least monthly) with the amount of work actually accomplished (not the budgeted amount or planned expenditures)."⁹

This is the information that is available in the CPR. Yet if the key to visibility is in the CPR, why does it appear that no one reads the CPR?

There are three reasons that could be the cause of the questionable acceptance of the CPR:

1. Program Managers (PM's) don't care about the cost impact on a development program.
2. PM's don't believe the CPR output.
3. PM's already know what's going on.

⁷The output from the contractor internal control system is sent to the government monthly.

⁸LTC Leonard S. Manella, doctoral dissertation "The Effect of the C/SCSC on Contractor Planning and Control", (Defense System Management School, 1973), p. 145.

⁹J. Ronald Fox, ADDRESS on Project Managers and Contractor Performance Measurement BEFORE AMC Project Managers Conference, (Washington, D.C., December 4, 1970).

Don't care about cost impact

A Rand study completed in 1971 suggests that the first reason is the more appropriate. "Cost increases seem to have been accepted in order to meet performance and schedule goals."¹⁰ This seems reasonable given the fact that the Project Manager is forced to be the project advocate when he reports to his superiors and the Congress. It is also a fact that the Project Manager is chosen from men with a background in performance (operations) not costs (procurement). It seems safe to say that the majority of Project Managers come from line positions in all services. It is logical that their personal motivation is for the very best technically proficient product.

The services are aware of the program advocate problem and write regulations to counterbalance this tendency on the part of program managers. A service regulation states very clearly: "Program Managers should emphasize costs and consider trade-offs involving performance and schedule".¹¹ We conclude that the reason for the questionable use of the CPR is not simply a lack of concern about costs.

Don't believe CPR

There are reasons to believe the second alternative for not using the CPR is valid also. The contractors we visited said that

¹⁰Robert Perry et al., "System Acquisition Strategies" Rand study (Santa Monica, 1971), p. 9.

¹¹Army Regulation No. 1000-1, Basic Policies for Systems Acquisition by the Department of the Army, (Washington, D.C., June 30, 1972), p. 6.

some of the CPR output is not valid, it was understandable that some program offices don't believe it.

The programs that employ a certain method for computing work accomplished¹² realize that at the beginning of the contract the CPR figures are inflated. On long duration contracts by the end of the contract the planned budgets are nowhere near the operational figures. Many things have happened to change the budgets. So the CPR figures are not representative of actual up to date plans. It is also true that the CPR comes out nearly three weeks¹³ after the close of the prior period. This is late news. We agree that these assertions are a problem.

Already know what's going on

Project managers are continually informed by their staff and the contractor. The PM is faced with many problems only one of which is cost control. In the briefings that constitute the major input to this manager, the emphasis is on progress and technical difficulties. "When faced with questions pertaining to cost control, project managers often erroneously believe the information required for funds control can also satisfy the information needs for cost control this is simply not the case."¹⁴

HOW USEFUL IS THE CPR?

The CPR is useful to some people for certain reasons.

¹²50/50 rule described in Chapter II.

¹³Two weeks to one month.

¹⁴J. Ronald Fox, Funds Control versus Cost Control (Army Logistician, May-June 1971), p. 6

Presently the report is used at many layers of government management. Each layer from the Defense Systems Acquisition Review Council (DSARC) to the Program Manager makes different kinds of decisions. The DSARC must decide if the product should be produced. The Project Manager must decide if an additional capability is worth the associated cost. It is possible that the Program Manager is one management layer that finds the information in the CPR of little short term value. This research indicates that some contractors don't think that some Project Offices use the CPR. This may be an indication of its value.

The authors think that the information available in the CPR does give the Program Manager the visibility he needs to manage if the contract expenditures fall inside a band around the original estimate. We maintain that the variance analysis that is performed on the original budget is of limited usefulness once the budget has been exceeded by a small percent and no management reserve exists to increase the budgeted figure.

Until the performance on the contract starts to exceed the estimate (overrun) the following objectives of the CPR are met:

1. early identification of the problems
2. effects of management actions
3. program status

However, once the projected cost at completion exceeds the contract target cost by a small margin the program status is no longer reflected in the CPR output. The visibility is still there, and the effects of management actions are still present, but the

status of the program begins to take two different forms. Both these forms can be called program status:

1. The contract performance measurement i.e., how close to the original plan the actual costs are running.
2. The internal performance measurement i.e., how close to revised plan the actual costs are running.

Once this overrun situation develops, there is a revised plan. The contractor is performing to that revised plan. This situation is described in Chapter III.

CHAPTER II

THE COST/SCHEDULE CONTROL SYSTEMS CRITERIA

Department of Defense Instruction 7000.2 entitled "Performance Measurement for Selected Acquisitions" was issued in December 1967 and revised in April 1972 (see Appendix A). It is a contractor performance measurement program which applies to all DOD programs qualifying as major Defense systems. DODD 5000.1, "Acquisition of Major Defense Systems", defines a major Defense system as RDT & E contracts in excess of \$50 million and production contracts which are expected to exceed \$200 million. The 7000.2 Instruction outlines criteria relating to cost and schedule measurement, which DOD requires the management control systems of the defense contractors to meet.

The criteria approach is intended to provide the contractor with a maximum amount of flexibility in determining how he wishes to conduct his internal operations. The Cost/Schedule Control Systems Criteria are not new. They are based upon the premise that certain basic features must exist in every management system in order to provide the information needed for proper control. The criteria were developed with industry participation and reflect the industry and DOD belief that they represent sound management principles. It is a DOD policy to avoid imposing unnecessary changes to existing systems in order to meet elements of the criteria. The Cost/Schedule Control Systems Criteria do not represent a management system nor do they present specific methods

of organization or operation. The criteria are intended to serve as standards for measuring the adequacy of management control systems. Contractors are free to organize in the manner best suited to their individual environments and management philosophies selecting their own internal methods and procedures. However, these methods and procedures must result in a system which provides the data and capabilities specified in the criteria in order to be considered acceptable to the Department of Defense.

Although there are thirty-five criteria, they are usually grouped into the following five major categories:

1. Organization. These criteria require that the contractor's system provide for clear definition of the overall contractual effort with a work breakdown structure serving as a framework for displaying subdivisions of effort. Integration of the work breakdown structure with the functional organization structure is required in order to provide for assignment of responsibility for identified work tasks. Additionally, integration of the planning, scheduling, budgeting, work authorizing and cost accumulating subsystems is a key element in an effective control system.
2. Planning and Budgeting. All authorized work must be planned, scheduled, budgeted and authorized within the system. Establishment of the performance measurement baseline is the key requirement of this section.
3. Accounting. Costs of completed work must be accumulated from the bottom up as directly as possible without need for allocations in summation. Cost of materials should be handled on an applied cost basis, if possible, in order that the cost of work does not include cost of materials on order or in inventory. A certain amount of latitude is provided in this requirement depending on the kind and amounts of material involved.

4. Analysis. Comparisons of actual versus planned performance are required by this group of criteria. Thresholds for variance analyses should be established to avoid excess effort which may otherwise result from analyzing every single variance. It is particularly important that variances be examined in terms of increments or aggregations of work which are large enough to produce significant information. Analyzing individual work package variances, for example, should not be necessary and would probably not be cost effective.
5. Revisions and Access to Data. Incorporation of changes authorized by the Government and due to internal re-planning are dealt with in this section. Particular emphasis is placed on the need to retain a meaningful performance measurement baseline. Other requirements include reconciliation of estimated costs at completion with funds requirement reports and provisions for access to data for systems evaluations.¹⁵

Most Government contractors have systems for budgeting, scheduling and authorizing work. The fundamental requirement of the DOD criteria is to integrate these systems. The contractors internal systems must be capable of providing: (1) Budgeted Cost of Work Scheduled (BCWS) - the time phased budget plan (baseline) which represents the contract work plan. (2) Budgeted Cost of Work Performed (BCWP) - sometimes referred to as the "earned value" or "planned value of work accomplished" it is the budgeted value of completed work. (3) Actual Cost of Work Performed (ACWP) - the actual cost to date. (4) Estimated cost at completion - based on performance to date and estimates of future conditions. (5) Budgeted cost of total contract. (6) Contract cost and schedule variances. (7) Traceability of variances to their source.¹⁶

¹⁵LTC. Robert R. Kemps, USAF, "C/SCSC, the DOD Cost/Schedule Control Systems Criteria," OASD (Comptroller) Briefing Paper, 1972, p. 17. See Appendix A for a complete listing of the thirty-five criteria.

¹⁶Ibid., p. 16.

The essence of the C/SCSC system is the requirement for the contractor to: (1) define the work to be done using a work breakdown structure (WBS) to the lowest discrete work package, level of effort, or apportioned effort, (2) integrate the organizational structure with the WBS, (3) establish schedules and budgets for all authorized work, (4) be able to accumulate costs by WBS elements and compare those costs against the planned schedules and budgets.

WHY DO WE NEED C/SCSC?

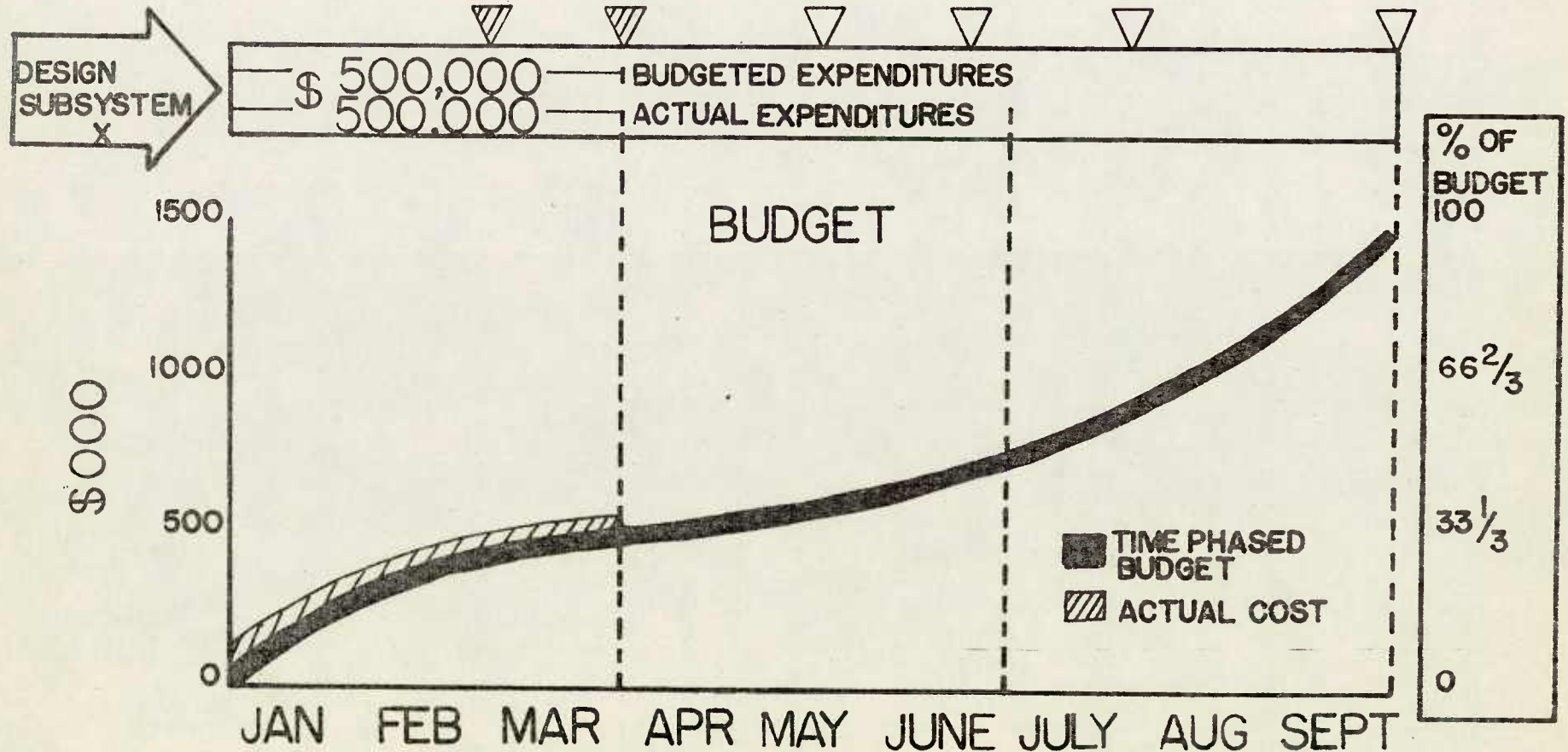
Why does the government need to use an earned value/performance measurement concept? The following example taken from a speech by Dr. J. Ronald Fox¹⁷ should illustrate. Figure 1 is a simplified 9 month project to design subsystem "X". It is scheduled to cost \$1,500,000 over nine months with six major summary milestones. The program manager seeks to correlate cost with progress by comparing the budgeted and actual rate of expenditure with the planned vs actual accomplishment of milestones. The chart shows that at the end of the first three months, \$500,000 has been spent as budgeted, and two major milestones have been accomplished on schedule. The information in Figure 1 satisfies a major part of the requirement of the program manager for funding information, since he can learn from the display that dollars are not being spent any faster or slower than budgeted. The information shown in Figure 1 may also lead a program manager to conclude that work is being accomplished as planned.

¹⁷Dr. J. Ronald Fox, "Contractor Performance Measurement", An address to a conference of Army Project Managers on 4 Dec. 1970 while he was serving as Assistant Secretary of the Army for Installations and Logistics.

MILESTONE CHART

FIGURE 1

▽ MILESTONE OR EVENT
 ▨ COMPLETED



A further examination of the work actually being performed, however, may reveal that the planned progress is not being achieved for the resources consumed and that significant overruns are occurring without the knowledge of the Government program manager. To observe how this can occur, examine Figure 2. This figure shows the four detailed tasks and their budgeted cost to accomplish the design of subsystem X.

In the first task, \$50,000 was budgeted to accomplish the first major milestone, and \$50,000 was budgeted for work remaining beyond the milestone in the first three-month period.

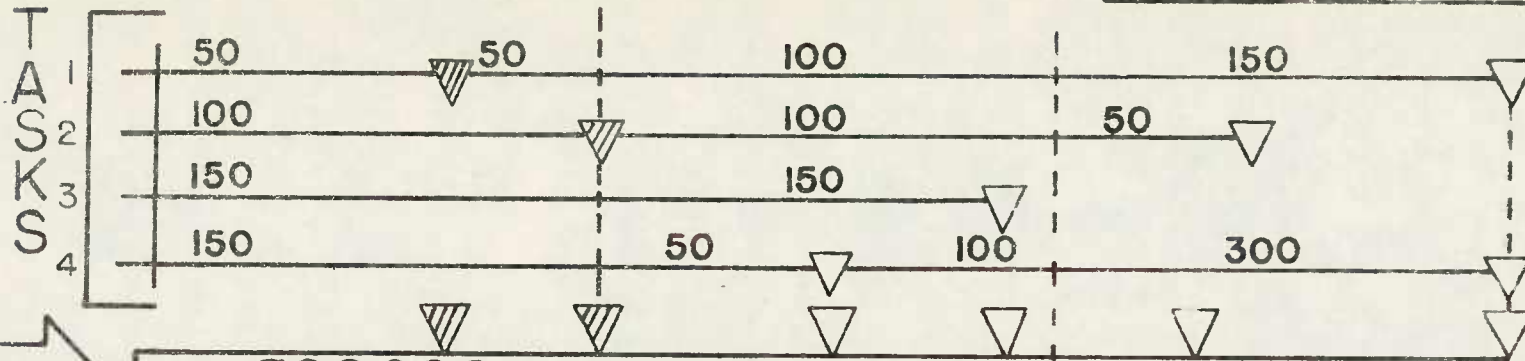
In the second task, \$100,000 was budgeted to accomplish the work leading to the milestone shown at the end of the three-month period. In the third and fourth tasks, \$150,000 was budgeted for each task during the first three months, but no major milestones were scheduled to occur on those tasks during that time period.

Figure 3 shows the manner in which resources were actually applied to the program. In the first task, \$50,000 was spent as budgeted to accomplish the first major milestone, and \$50,000 was spent as budgeted during the remainder of the first quarter. In the second task, problems were encountered in accomplishing the first major milestone. In order to accomplish the milestone on schedule, \$250,000 was spent rather than the budgeted \$100,000. In solving the problems encountered in task 2, manpower was applied that had previously been planned for tasks 3 and 4. This action resulted in task 3 consuming only \$50,000 and task 4 consuming only \$100,000 - rather than the \$150,000 planned for each of these tasks.

FIGURE 2

MILESTONE CHART

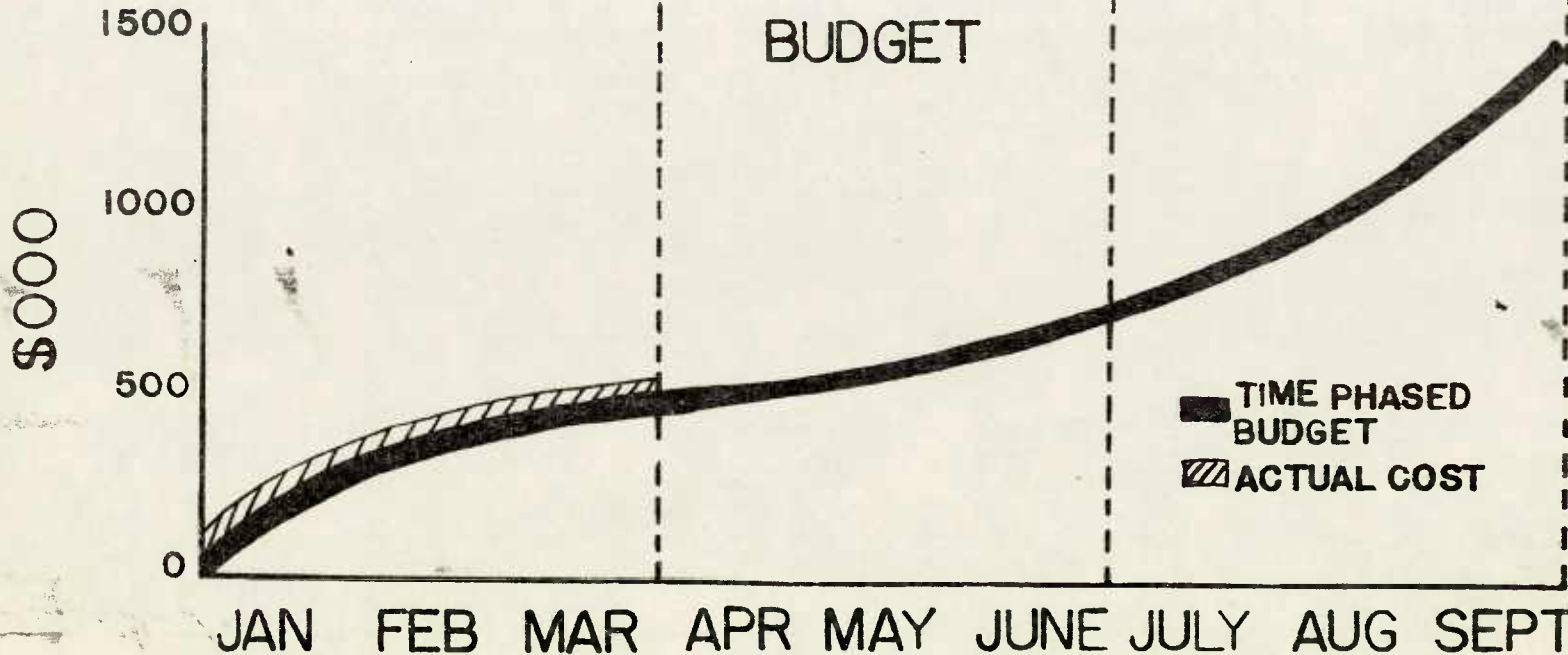
▽ MILESTONE OR EVENT
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DESIGN SUBSYSTEM X

\$500,000 BUDGETED EXPENDITURES
 \$500,000 ACTUAL EXPENDITURES

BUDGET



% OF BUDGET
 100
 66²/₃
 33¹/₃
 0

In total, \$500,000 was spent during the first three months as planned, despite the changes in the application of the funds among the individual tasks. However, while \$500,000 was spent in total, the budgeted value of the work actually performed was only \$350,000. This results from the fact that the work actually accomplished in task 2 was budgeted to cost \$100,000 but actually cost \$250,000.

The changes in the application of resources to the work being performed may re-occur during the second quarter and still go undetected by a program manager who is only correlating milestones accomplished with the rate of expenditure curve. At the end of the second quarter, \$1,000,000 is likely to be spent in total, as budgeted, and the major milestones are likely to have occurred. If the program manager is not aware of the budgeted value of the work actually performed, however, he is likely to be unaware of the significant deviations from the budget occurring in the first two-thirds of the program.

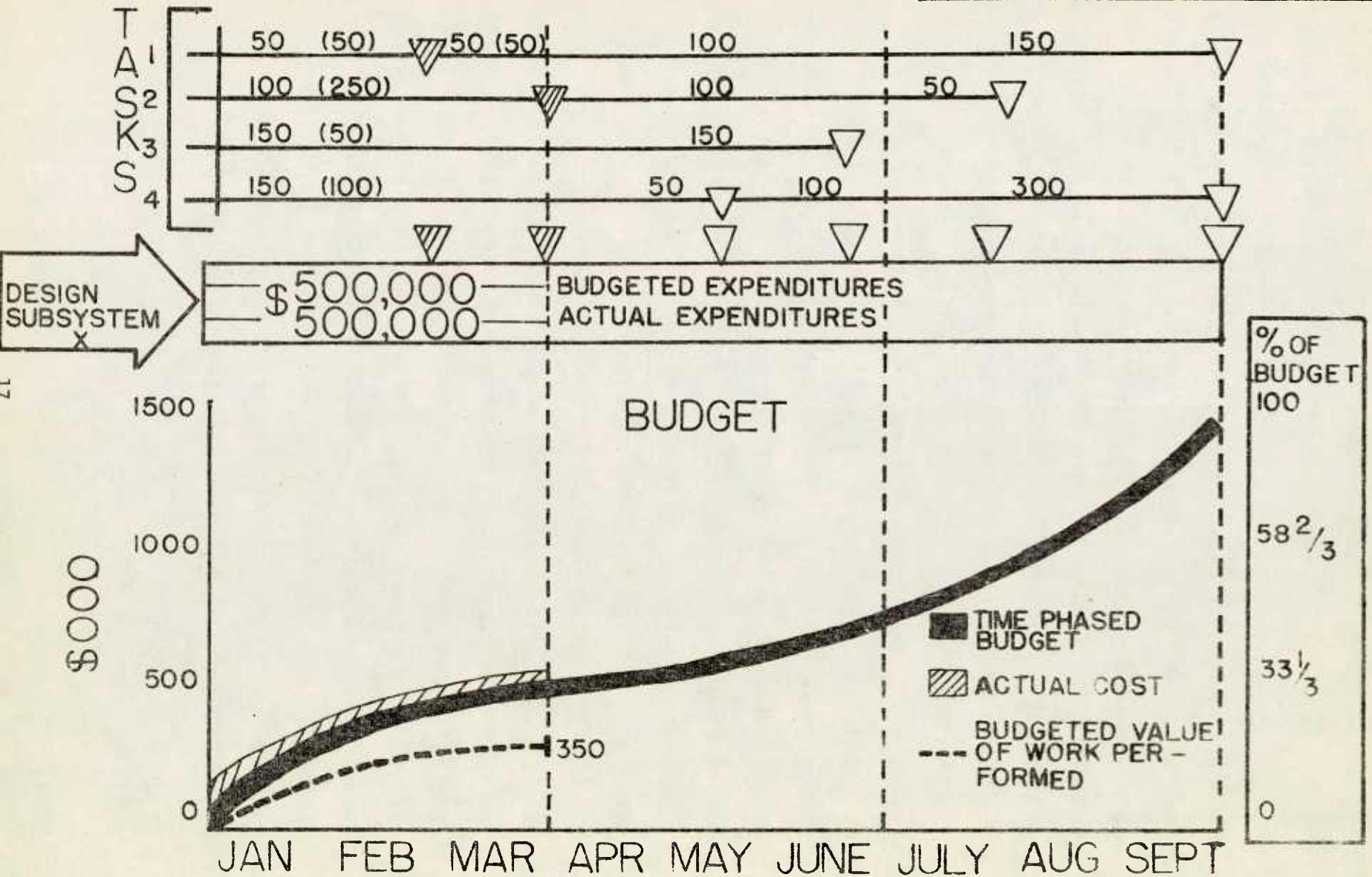
The \$150,000 overrun which occurred during the first quarter could have been identified early in the program with one additional bit of information - namely, the summation of the budgeted value of the work actually performed to date. With this information available, the program manager would be able to see that \$500,000 had been spent at the planned rate, but the budgeted value of the work actually performed was only \$350,000.

This gives an early visibility to an overrun which on the basis of the planned vs. actual expenditure curves, in conjunction

FIGURE 3

MILESTONE CHART

▽ MILESTONE OR EVENT
 ▽ COMPLETED



with milestones, would have been hidden. Even in the next quarter the overrun could have remained hidden if the resources budgeted in the second quarter for the first and second tasks were diverted to the third and fourth tasks so that the milestones could be achieved. Or possibly resources budgeted for the third quarter could be moved "upstream" to the second quarter to permit achievement of the milestones. Thus the overrun could be hidden until the end of September.

The key to the Performance Measurement system in Figure 3 is the curve labeled Budgeted Value of Work Performed. It is known by several terms: Earned Value, Planned Value of Work Accomplished (PVWA), Budgeted Cost of Work Accomplished, but the commonly accepted term in the Department of Defense is Budgeted Cost of Work Performed (BCWP). To continue with the commonly accepted DOD Terminology we will identify the time phased budget in Figure 3 as the Budgeted Cost of Work Scheduled (BCWS). The curve representing the actual dollars spent is called the Actual Cost of Work Performed (ACWP).

Figure 3 is representative of an internal control system which meets the criteria. By looking at the Budgeted Cost of Work Performed (BCWP), we can clearly see the \$150,000 overrun at the end of the first quarter. The overrun is disclosed early enough that the contractor's managers have time to take corrective action or to select an alternative other than just seeking additional funds or making a precipitous reduction in the work to be performed during the last quarter of the program.

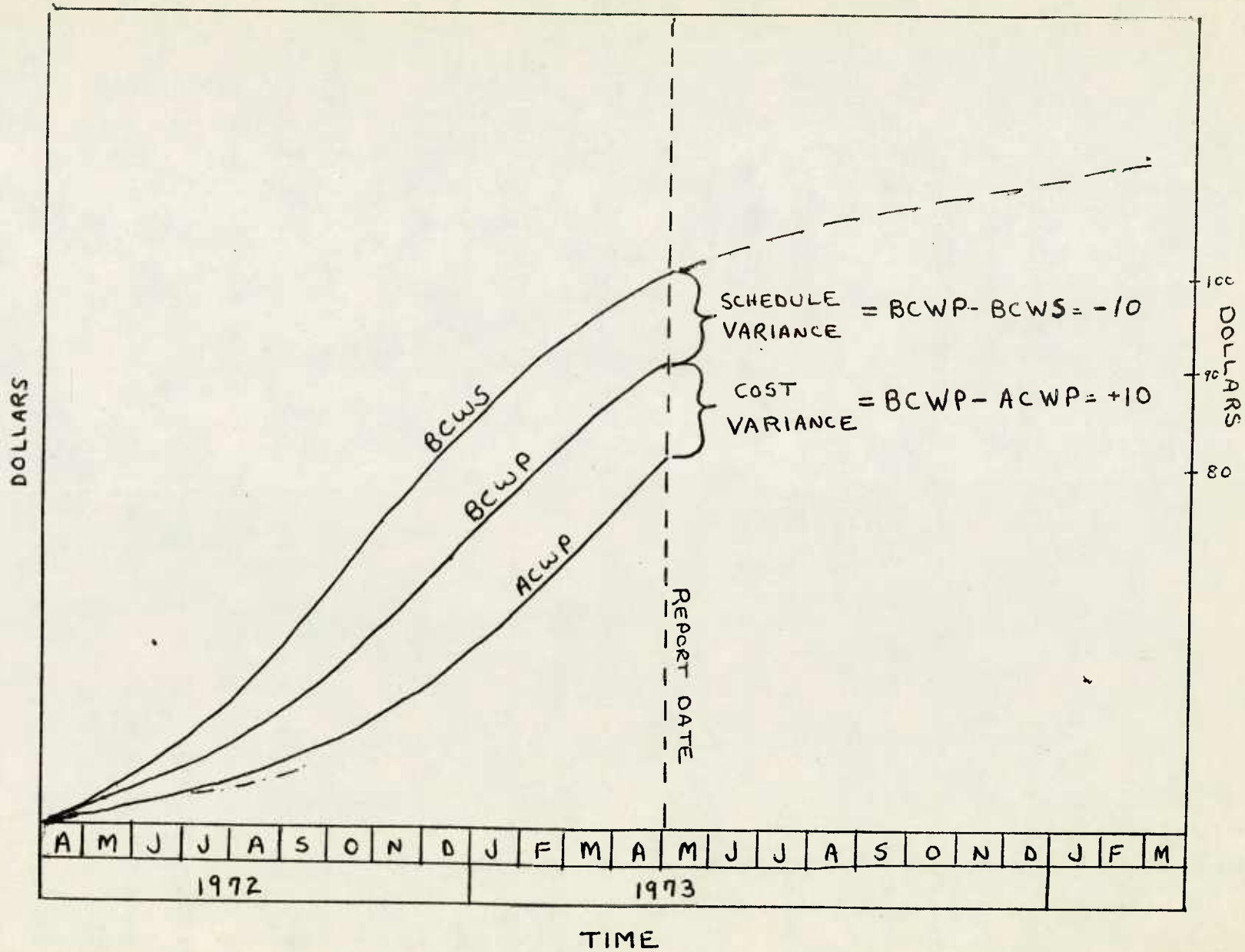


Figure 4

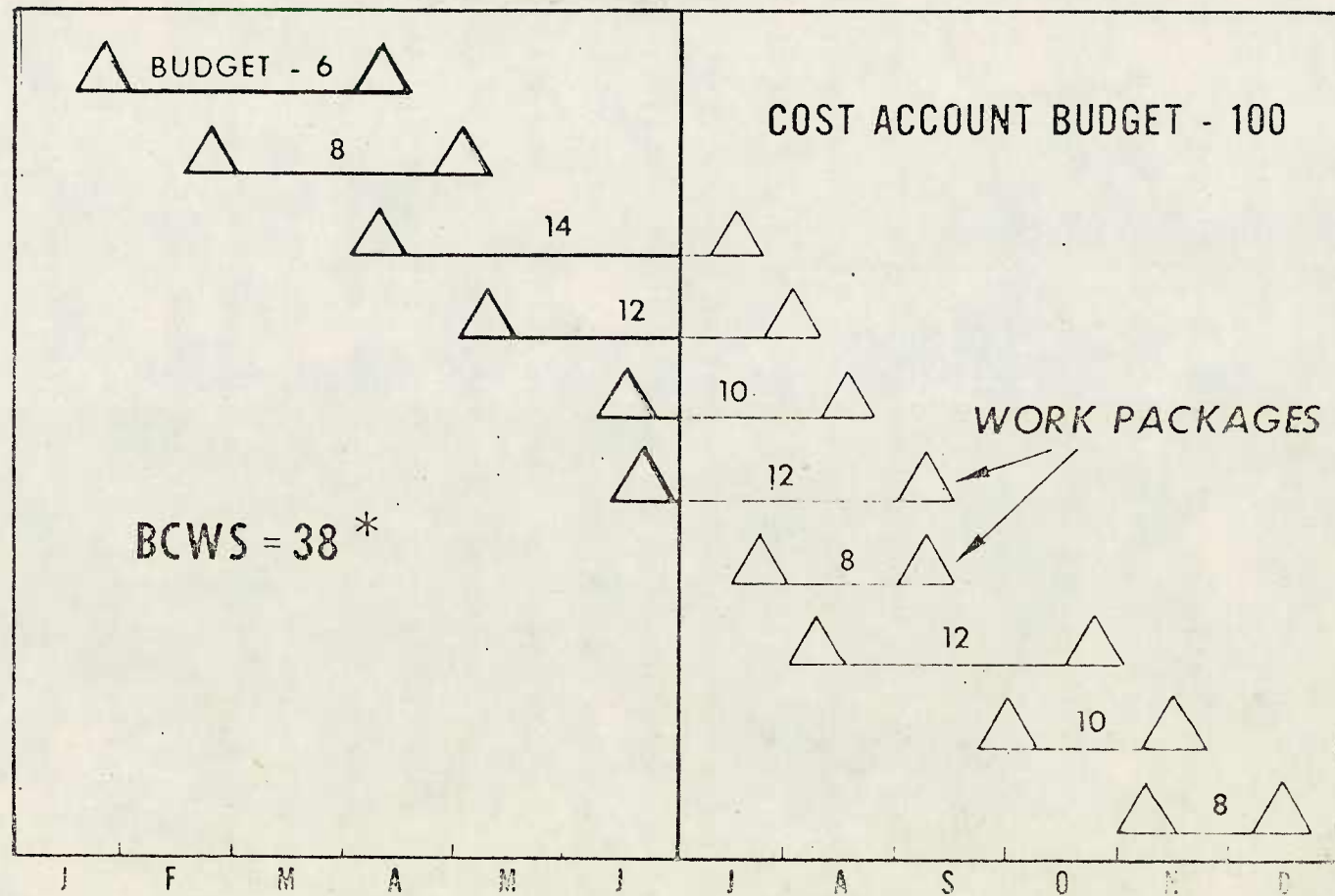
To determine an overrun we compared the Budget for the work done (BCWP) with actual costs (ACWP). Using Figure 4 we see that having the BCWP greater than the ACWP generates a positive cost variance. By comparing the budget of the scheduled work (BCWS) with the budget of the work performed to date we can identify, in dollars, how far ahead or behind schedule the project is. In Figure 4 the negative schedule variance indicates the program is not on schedule.

The Budgeted Cost for Work Scheduled (BCWS) is a time phased budget. To determine the BCWS the budgets applicable to work that was to have been accomplished are added to the portion of the budgets for work-in-progress that was scheduled to be completed. In Dr. Fox's example (Figure 3) the budgets were apportioned by quarter. The criteria permits the contractor to select whatever work-in-progress measurement technique he desires. The most common method used by contractors is the 50-50 rule (see Figure 5).

The 50-50 technique simply permits 50 per cent of the work package budget to be added to the BCWS at the time the work is scheduled to begin. The additional 50 per cent is added to the BCWS at the time the work is scheduled to be completed. To determine the BCWS in Figure 5 on June 15 we simply add the two work packages to be accomplished ($6 + 8 = 14$) to 50 per cent of each of the work packages scheduled to be in process ($\frac{14}{2} + \frac{12}{2} + \frac{10}{2} + \frac{12}{2} = 24$). The total value of the BCWS on 15 June is 38 ($14 + 24 = 38$).

The BCWS is the budget applicable to the work scheduled. The technique for determining the work actually accomplished

BUDGETED COST FOR WORK SCHEDULED (BCWS)



* 50-50 RULE USED FOR WORK IN-PROCESS

SOURCE: Office of the Assistant Secretary of Defense (Comptroller)

Figure 5

(BCWP) is the same as used for the BCWS. The budget for the work accomplished in Figure 6 is the budget for work packages completed ($6 + 8 + 14 = 28$), plus 50 per cent of the budget for work-in-process ($\frac{12}{2} + \frac{10}{2} + \frac{12}{2} + \frac{8}{2} = 21$). The Budgeted Cost for Work Performed (BCWP) on 15 June is 49 ($28 + 21$).

Comparing the scheduled work (BCWS) in Figure 5 with the accomplished work (BCWP) in Figure 6 we see that the program has a positive schedule variance, indicating the value of the work done ahead of schedule is 11.

At this point the reader may be concerned about the fact that a contractor could create a positive variance by merely opening work packages early. Our research did show this to happen on rare occasions. The program managers can normally detect it rather quickly and with short work packages the distortion may not be significant.

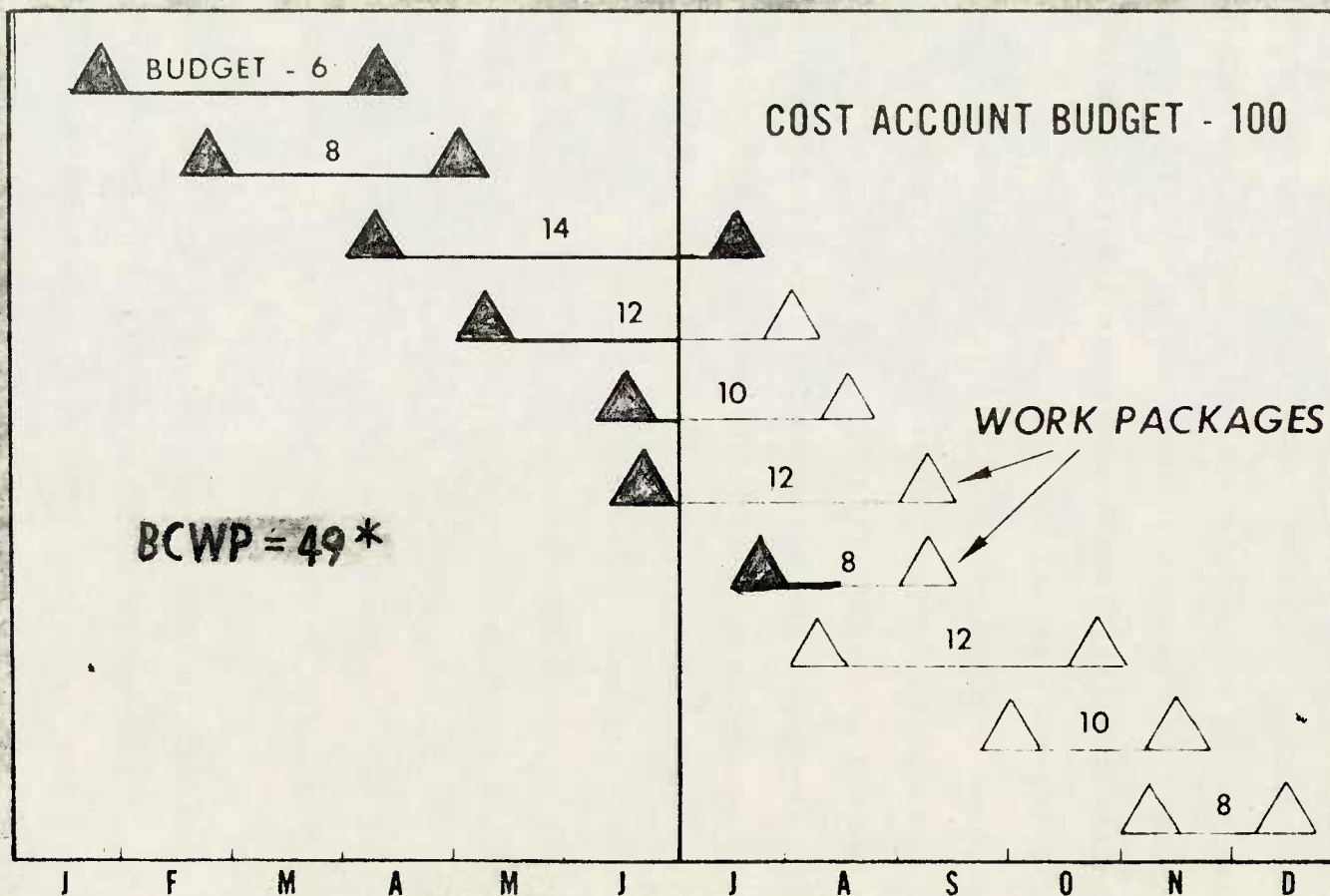
It is not a requirement that both BCWS and BCWP be determined using the same technique but in order to make the schedule variance as accurate as possible it is recommended that both budget values be computed using the same method.

The cost account element of the C/SCSC system stands out as the most significant from a management point of view.¹⁸ The cost account is ordinarily established by the contractor at the lowest level in the work breakdown structure at which costs are collected and compared with budgets (see Figure 7). The cost

¹⁸Kemps, "The DOD Cost/Schedule Control Systems Criteria", p. 43.

BUDGETED COST FOR WORK

PERFORMED (BCWP)



* 50-50 RULE USED FOR WORK IN-PROCESS

SOURCE: Office of the Assistant Secretary of Defense (Comptroller)

Figure 6

account is the main action point for planning and control of contractual effort. Virtually all aspects of the system come together at the cost account including budgets, schedules, work assignments, cost collections, progress assessment, problem identification and corrective actions. Day-to-day management is accomplished at the cost account level. Most management actions taken at higher levels are on an exception basis in an effort to solve the significant problems.

For these reasons, the WBS and functional levels selected for establishment of cost accounts should be carefully considered at the outset of a new contract to insure that the work will be properly defined into manageable units and the functional responsibilities are clearly and reasonably established. The quality and amount of visibility available to a program manager during the performance of the contract will be directly relatable to the level and make-up of the cost accounts.

By using the cost account values for budgeted cost of work scheduled (BCWS), budgeted cost of work performed (BCWP) and actual costs of work performed (ACWP), variances can be identified at any desired level by summing the applicable cost accounts below that level.

By summing the BCWS of all accounts up to the highest level of the WBS a performance measurement baseline is created. In Figure 4 the BCWS is the Performance Measurement Baseline. The baseline and problems associated with the baseline are discussed in Chapter III.

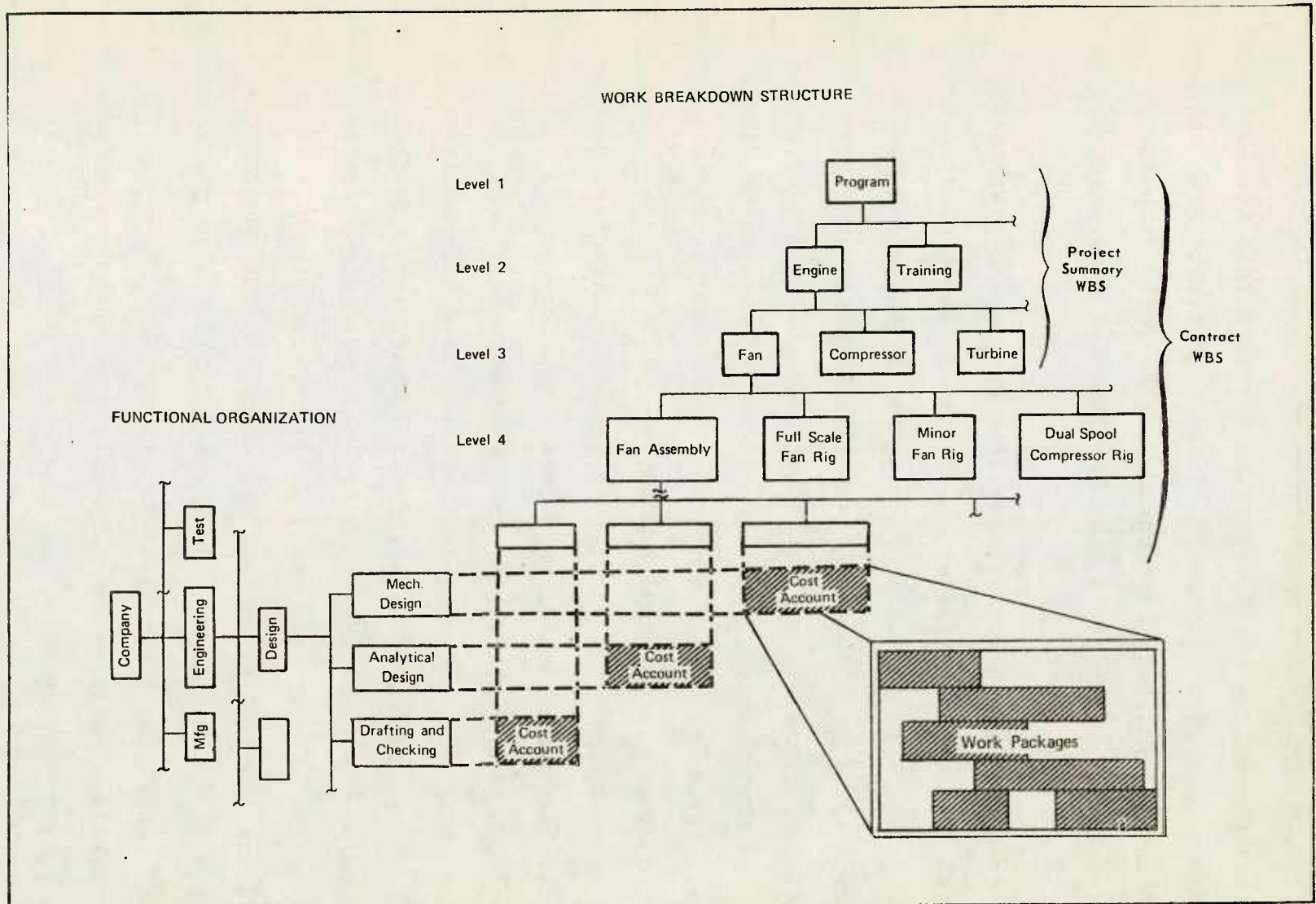


Figure 7 Integration of WBS and Organizational Structure.

SOURCE: JOINT IMPLEMENTATION GUIDE

In addition to the requirements discussed above, C/SCSC has other provisions which assist in ensuring that the internal management control system can be truly effective. All contractor procedures and policies are required to be fully documented. Additionally there is to be only one internal management system with a single set of books.

Perhaps the one requirement with which most contractors disagree is that of having material planned and accounted for at the point of usage. This requirement is one which contractors feel is only of benefit to the government. Contractors normally control their material costs at the points of commitment and receipt. Consequently, contractors who do not already have a material issue and transfer system find themselves installing one "just to report to the government".

DODI 7000.2 requires that government contractors have an internal management system which meets the Cost/Schedule control criteria. It does not require any specific reporting. DODI 7000.10 (See Appendix B) prescribes the format of the Cost Performance Report (CPR), the vehicle to collect summary level cost and schedule performance data. The CPR has undergone a number of minor format changes over the last six years but the purpose of collecting and displaying data directly from the contractor's data base has not changed. In addition, the CPR is the document used to report the analysis of variances.

Variance analysis and traceability of data are important concepts intrinsic to C/SCSC. (See Figure 8)

ANALYSIS

VARIANCE ANALYSIS

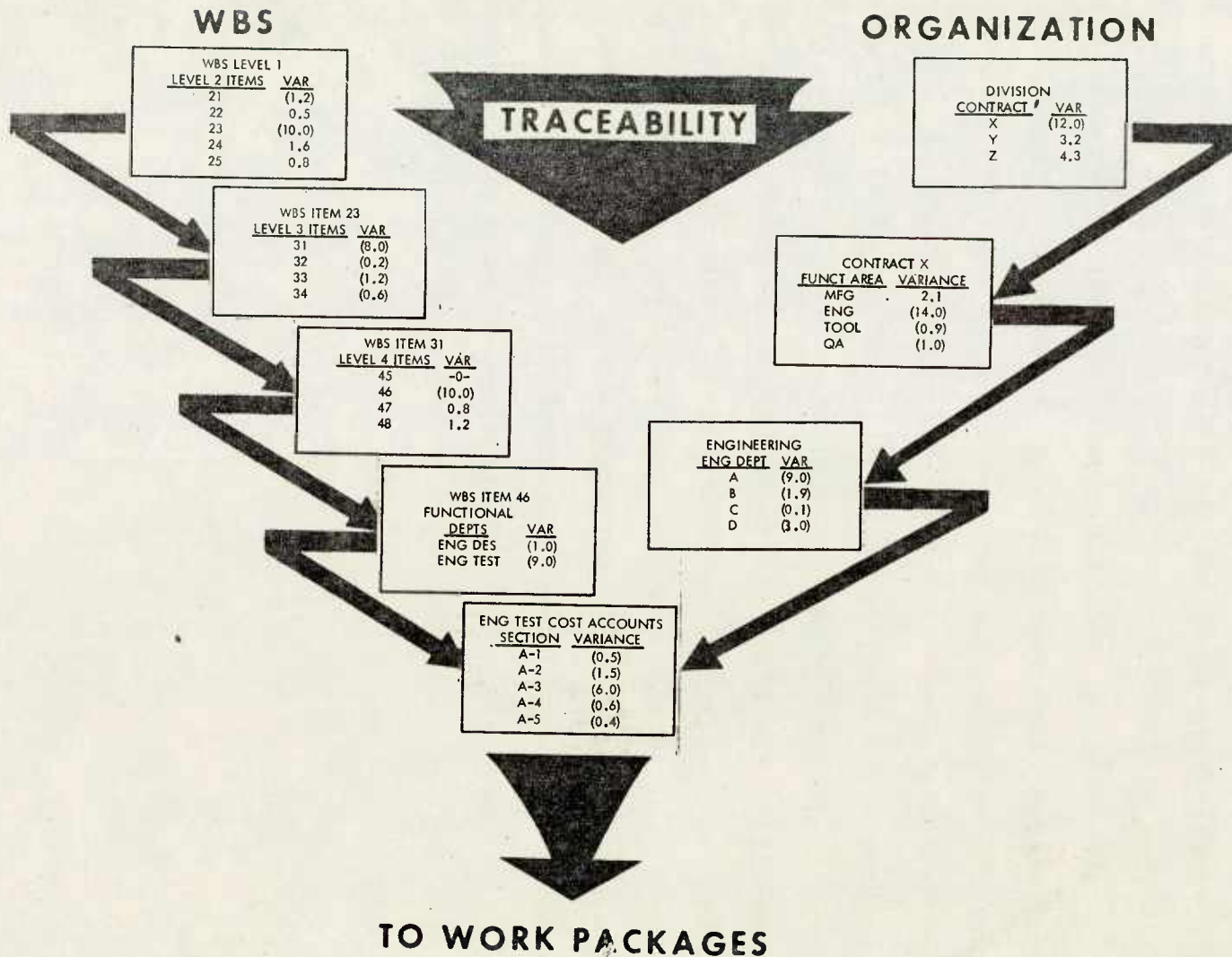


Figure 8

SOURCE: Office of the Assistant Secretary of Defense (Comptroller)

Although many variances will be washed out in the accumulation of both favorable and unfavorable variances during summarization, significant variances will often appear at summary levels. It should be a relatively simple matter to trace these variances to their sources through either the WBS or organizational structure. (See Figure 6)

In most cases, problems causing significant variances are already known to project management through other formal or informal reporting systems and corrective action may already be taken before the Cost Performance Report is available. The report must, however, accurately depict the cost impact of the problem, information which may be difficult to ascertain otherwise. Occasionally, the Cost Performance Report will identify a cost problem previously unknown to top level management, but this should be the exception rather than the rule. However, on a tightly budgeted program, large numbers of small unfavorable variances may be adding up to a major cost problem. In such situations a disciplined, formally structured system is required to show the true cost status on a systematic routine basis.¹⁹

¹⁹Ibid., p. 49.

CHAPTER III

PROGRAM STATUS

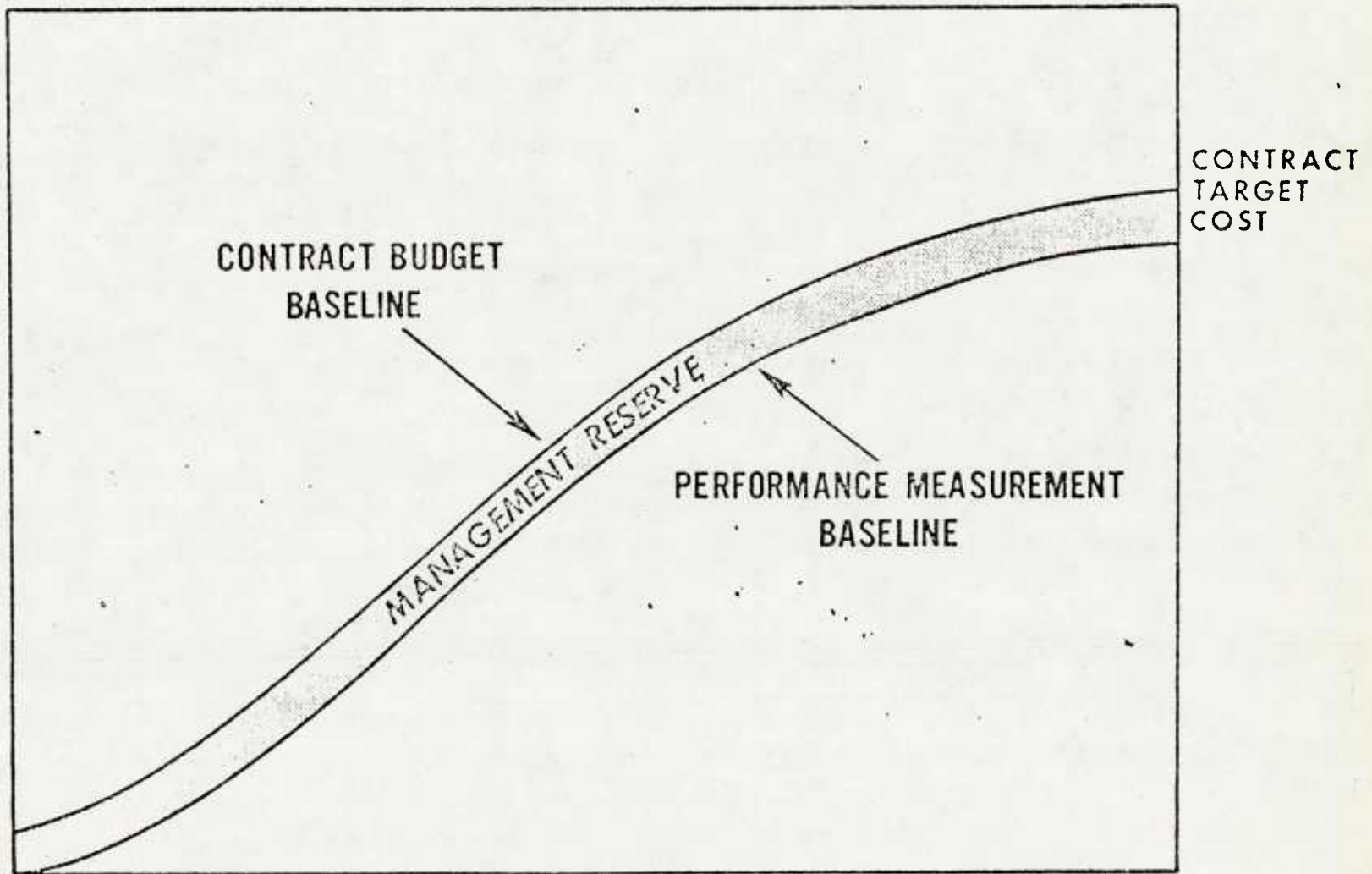
The goal of a contract performance measurement system is to accurately reflect current program status. "The program status function contains two separate elements. The Cost/Schedule Control Systems Criteria (C/SCSC) which establish the standards of acceptability for the contractor's internal Cost/Schedule Control System and the Cost Performance Report (CPR) which enables DOD program manager to obtain information from these systems."²⁰

In order to appraise the status of a program it is necessary to develop some basis for comparison of where the program is and where it was planned to be. This plan is a cost/schedule estimate that is time phased throughout the life of the contract (exhibit #III 1). The end point for the estimate is the contract target cost (less management reserve). This estimate has evolved into a very specific titled line; the contract performance measurement baseline.

There are two baselines at the start of a contract (exhibit #III 1), however in most instances the two baselines eventually blend into a single baseline as the management reserve is depleted (exhibit #III 2). This management reserve is designed to be used as a contingency and is eventually entirely depleted. We will assume that there is no management reserve in this discussion of the contract performance measurement baseline.

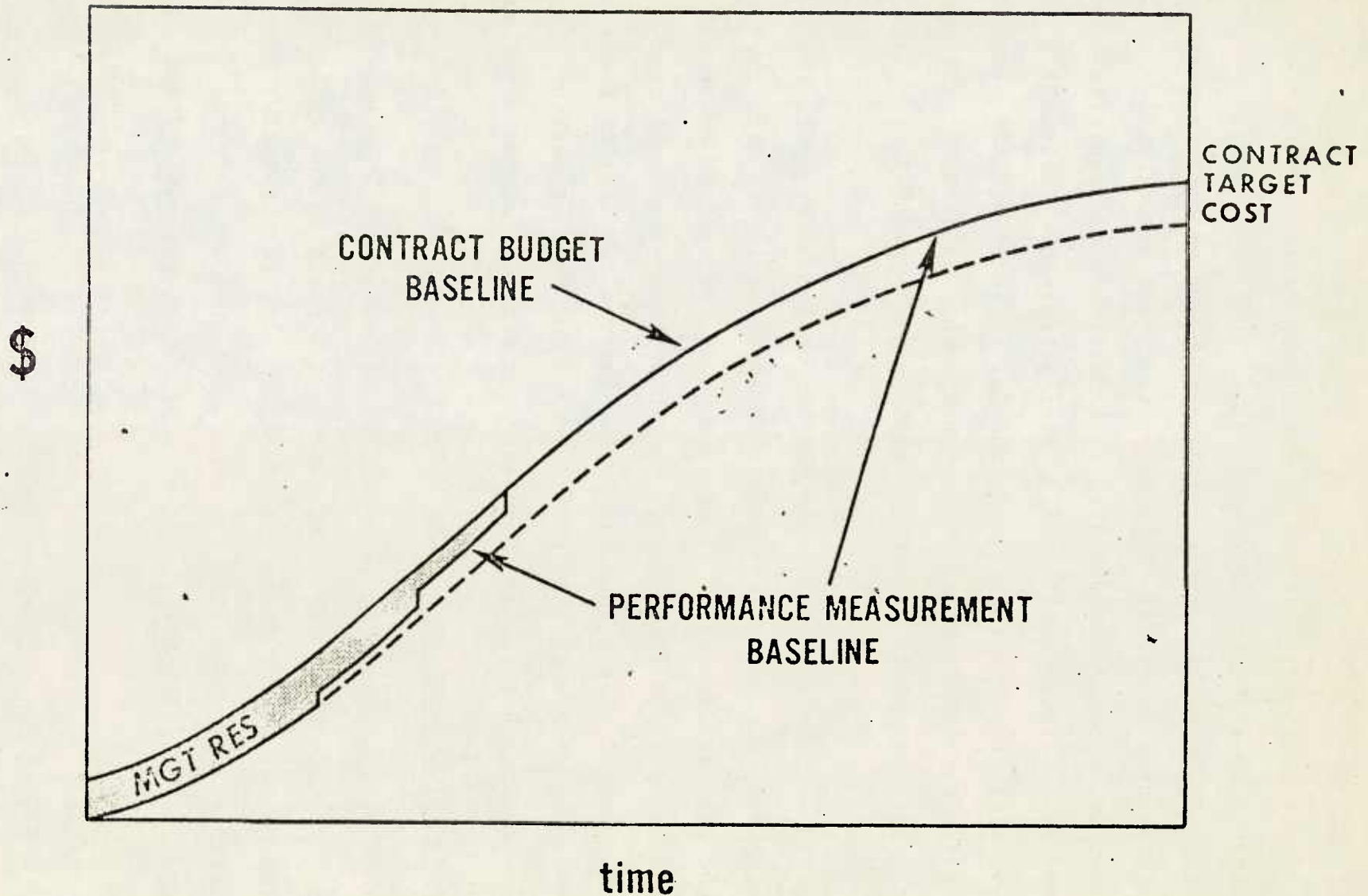
²⁰Kemps, Contractor Performance Measurement, p. 44.

THE BASELINE (S)



SOURCE:
OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (COMPTROLLER)

USE OF MANAGEMENT RESERVE



SOURCE:
OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (COMPTROLLER)

It is generally accepted by Government managers that the performance baseline should be maintained (unaltered except contractually) to allow a consistent comparison with the actual costs presently incurred. This consistency has not always existed, and should be emphasized as a desirable prerequisite for contract status comparisons. "When performance (Status)* is deviating from plan, a common tendency is to change the plan so that it resembles actual performance. This is done by shifting budgets from one piece of work to another or by allocating budget in excess of the contract value."²¹

The authors found examples of this budget shifting in the research sample. One reason that this budget shifting occurred was not for the purpose of deception. Most contractors we talked to readily admitted that budgets were exchanged when in an over or under budget status to allow better internal control of funds. It is our opinion that this wasn't done to confuse or mislead the Government, but rather to control the program internal funding.

THE CONTRACTOR BASELINE DILEMMA

There are two distinct yet not separate elements of the "budget": the dollar figure estimated to accomplish the task(s), and the dollar figure authorized to accomplish the task(s). Unfortunately they sound like the same thing. To simplify the discussion the estimated figure will be called the budget, and

*Added by authors.

²¹Kemps, Contractor Performance Measurement, p. 45.

the authorized figure will be called the funding. (This funding level has some association to the contract funds status associated with contractual obligations, however it is better described as an internal control vehicle).

It is easiest to visualize the problem if the argument is constructed at the level of a discrete work element rather than the summarized baseline. For example, a work element was estimated to cost \$1,000, and take two months to accomplish. After a month it is clear that \$2,000 will be required to accomplish exactly the same work (no change in scope). Where does the additional \$1,000 of funds come from? It comes out of the contractor's hide! It's an overrun. Simple? Not if you're the contractor.

Contractors can't allow their subordinates to operate without some form of funding control. To take an extreme case, if all discrete work elements couldn't be accomplished for the estimated budget, the whole program would be out of control if the contractor management didn't put a ceiling on subordinate spending.

So the contractor uses some method to control his subordinates; he can't use the budget, this figure is obsolete in our example. (A description of the alternatives will be given in Chapter IV). Now there are two control baselines: the estimated budget (for the Government) and the authorized fund ceiling (for the contractor). The reader may be thinking that there is only one baseline, the other figure is an internal ceiling and has no

basis for contract performance measurement. That depends on how performance measurement is defined, and who is defining it. We will explain.

CONTRACTOR PROGRAM STATUS

In order to decide what is, and what is not, a measure of program status the authors asked contractors what dollar figure contractor management used internally to measure their subordinates performance. It wasn't the estimated budget. Not one contractor in the research sample thought of the original estimate as anything but an estimate. "Things change in development contracting!" "You can't expect an estimate to be accurate." "The only number that means anything is the estimate at completion, the budgets that summarize to the target cost are almost fictitious if any real problems have developed."²²

In fact the Fitzhugh Study expressed much the same opinion: "It should be axiomatic that one cannot place a price on an unknown; yet, the increased resort to fixed-price contracts, the use of precontractual cost estimates as a firm baseline for measuring performance throughout the life of the system, and the shock reaction which is forthcoming when cost overruns or growths are experienced, all evidence an unwarranted degree of confidence in cost estimates."²³

²²Opinions expressed by three different contractors.

²³Blue Ribbon Defense Panel, Report to the President and the Secretary of Defense on the Department of Defense, (Washington, D.C., July 1970), p. 83.

It is not an easy process for a contractor subordinate manager to change his fund ceiling. There is an internal negotiation process that the contractors follow in changing the fund levels of budgeted work elements. One can debate about forcing the contractor to stick to budgets. Some people we talked to made the assertion that the system is designed to do just what it is doing; which is to force the contractor to develop an internal control system. However one thing is obvious. After a program has experienced some cost growth, the Government and contractor managers are measuring the performance of different things: one budgets; the other, revised budgets. (The assumption is that the Government program manager uses the CPR output for something...this may be an over-assumption given the discussion in Chapter I.)

WHAT IS PROGRAM STATUS?

There seems to be two very different views as to what program status and performance measurement really are.

The Government view, as expressed by the Senate Armed Service Committee, is that performance measurement "should provide early identification of any problems related to the cost and progress of a program that could enable alternative or corrective action to be taken".²⁴ This suggests a comparison is necessary between the original estimate of costs to date and the actual costs associated with the work accomplished to date. This

²⁴Fox, Contractor Performance Measurement, p. 38.

view probably stems from the fact that government officials are required to report the status of programs to the Congress annually. It is a requirement that there is consistency between one reporting period and the next. One thing that is consistent is the cost target in the contract (ignoring engineering changes etc.). The Government is concerned about contract performance measurement; what the contractor is spending vis-a-vis what he agreed he would be spending.

The contractor's view of performance measurement is somewhat different. Lacking the requirement for consistency, it makes more sense to measure a subordinate's performance as an evolutionary process, with logical (and internally agreed) changes being the basis for measuring performance. The revised budget or fund ceiling is the new baseline for internal performance measurement. The original estimated budget is the basis for measuring forecasting efficiency but is very different from that of performance. This is one reason contractors want to change the "baseline".

INTERNALLY CHANGING THE BUDGET

The point where the program is controlled by the contractor is that level where the funds are approved (negotiated) for work elements. This level varies from contractor to contractor depending on the degree of decentralization.

It could be argued that this is the logical point for Government program controllers to monitor the program performance, the internal funding changes. If this process were formalized each change in baseline could be monitored and agreed to by the

Government. The present status would be visible.

PERFORMANCE MEASUREMENT VS. ESTIMATING MEASUREMENT (STATUS)

The on-going management of the contract, at whatever internal management level, is the place where actual performance can be measured. The basis for performance measurement will change as the contract matures: The contract target cost will not change; estimating measurement is very different from performance measurement.

As a contractor if I estimate I can do something for \$100, and a week later estimate that it will cost \$150...and the cost is recoverable, the buyer may think that I cannot estimate very well, but that buyer can be assured that I think I'm performing to the \$150 figure...so do the lower level contractor managers we talked to. To maintain that the original estimate was \$100 doesn't accomplish anything. This original estimate should not be forgotten because it will affect certain decisions. However for performance purposes, the critical number is the \$150 number. Variance reporting should be done on that number to determine its accuracy.

"It seems to me (and us) that a system like this - a performance measurement system - is not going to stop cost growth; it isn't going to stop overruns. If it is going to do anything, it is going to provide you with the luxury of being able to see the impending financial problems at a time when you can make tradeoffs later on in your program, and not cause you to be

placed in a position where you are way downstream learning that you have a substantial cost growth."²⁵ If the cost growth is admitted and agreed to by the Government the objective of performance measurement (visibility) has been achieved. A new baseline is in order.

The requirement for an estimating measurement, or program status, based on original contractual agreements will never change so long as the Congress controls appropriations. The baseline originally conceived resolving to the contract target cost should never be changed and always reflected in reports to certain Government managers. However...the contractors have developed elaborate computer systems for management control. These management information systems cannot be used effectively to generate variances on obsolete budgets that no one uses except the people who report to Congress. There should be two baselines (realizing management reserve already depleted):

1. the original estimated baseline kept visible to be used when necessary;
2. an updated performance baseline approved by the Government program office.

This updated baseline should be agreed to by both the contractor and the Government. The contractor uses an updated baseline anyway, the Government might as well recognize it (explained in Chapter IV).

²⁵Fox, Address to AMC Project Managers Conference.

A notification of fund requirements exists already, and is accomplished at project reviews with the contractor. It is the authors' contention that fund notification should be formalized periodically, and put on the computer where the cost impact can be better understood by anyone who reads the CPR output. This cost/schedule information should be used for everyday decisions, tradeoffs, etc. It should not be used to report to the decision maker who must decide whether the weapon system should be terminated. That decision maker should get the original baseline to see the cost growth; the program status.

There are two different disciplines: performance and status. In trying to mix them, both are lost. The authors contend that you cannot make a contractor develop a system at an estimated budget if he has a cost recoverable contract. The contractor performance is what his internal managers agree they will accomplish for a stated cost. This stated, internally agreed, figure should be in the management information system. The program status can be computer based also but should not be used as a surrogate for performance.

CHAPTER IV

PRESENT PERFORMANCE MEASUREMENT

INTRODUCTION

The environment in which development contracts are awarded must be considered in describing the control system for performance measurement. The principle contractor emphasis while formulating the proposal is marketing. Pricing the proposal, design of the technical parameters, and structure of the proposal are based predominantly on the desire to "sell" the product to the government. In fact, some have gone so far as to say that the "unsuspecting technical department is, in fact, the marketing department".²⁶

The contractor is faced with the dilemma of proposing an accurate target cost and losing the contract, or proposing an optimistic target cost and being measured against it. Because development contract costs are paid by the government the more desirable alternative is proposing an optimistic target cost.

A second environmental variable to consider is uncertainty. Development contracts have a good deal of uncertainty or they wouldn't be under development. This uncertainty results in inaccurate estimating. It is extremely difficult to approximate costs on a system that is to be designed in the future. This has been proven by contractor performance in the decade of the sixties "typical programs continued to exhibit an average cost

²⁶Sal F. Divita, Selling R & D to the Government (Harvard Business Review, Sept.-Oct. 1965), p. 68.

growth of about 40 percent (corrected for quantity changes and inflation), a schedule slip of about 15 percent..."²⁷

DIVISION OF WORK

Budgets are prepared throughout the contract life. These budgets are continuously broken into smaller increments of work as the work can be defined. At some point the responsible manager stops dividing the work, and a control account is formed. If these control accounts are totalled for any point in time, the value of that sum of control accounts is a point on a line. The total line is the performance measurement baseline that was described in Chapter III.

The baseline is a running total of the estimates for the control accounts that have been established. The total of all the blocks of work must equal the contract target cost, minus a contingency fund. The contingency fund is called the management reserve. It has no unique control account designation, and can be thought of as the difference between the performance measurement baseline and the time phased contract target cost (see exhibit III. 1).

As in the last chapter, we will assume the management reserve has been fully depleted (see exhibit III. 2). Prior to the point where the management reserve is fully depleted this contingency fund provides a vehicle to allow estimates to be increased.

²⁷Perry, "System Acquisition Strategies," p. v.

The performance measurement baseline is the vehicle that is presently being employed by the Government to track the progress of a program. The estimated budgets that make up this baseline are altered by the contractor for internal control purposes. This budget alteration has been for two basic reasons: initial optimistic target costs and/or subsequent unforecasted program difficulties.

The contractor that has deliverately bid optimistically low on a development contract may be willing to forego his profit in the hope of getting the future production contract that can be more lucrative. This fact is substantiated by a study of 742 Army contracts which concluded that "incentive provisions have very little influence on cost overruns".²⁸ This is not as detrimental to corporate objectives as it may seem. The increase in the overhead base brought about by the award of a development contract may be as palitable as the profits that are relinquished.

INITIAL OVER OPTIMISTIC TARGET COST

Contractor interviews have revealed three internal control alternatives if an initial over optimistic target cost was realized.

1. run above budget (overrun); maintain the baseline, authorize more funds;
2. alter the baseline (engineering changes);
3. shift the budget to delay government awareness; change shape of the baseline.

²⁸W.B. Williams et al., Effectiveness of Contract Incentives, (Procurement Research Office, August 1970), p. 38.

The first alternative is to operate each control account (adds to the baseline) in an overrun status. This approach has the detrimental effect of informing the government of an anticipated contract target cost overrun which reduces contractor fees and the progress payments related to the fee. It does allow internal control because the fund authorization can be monitored.

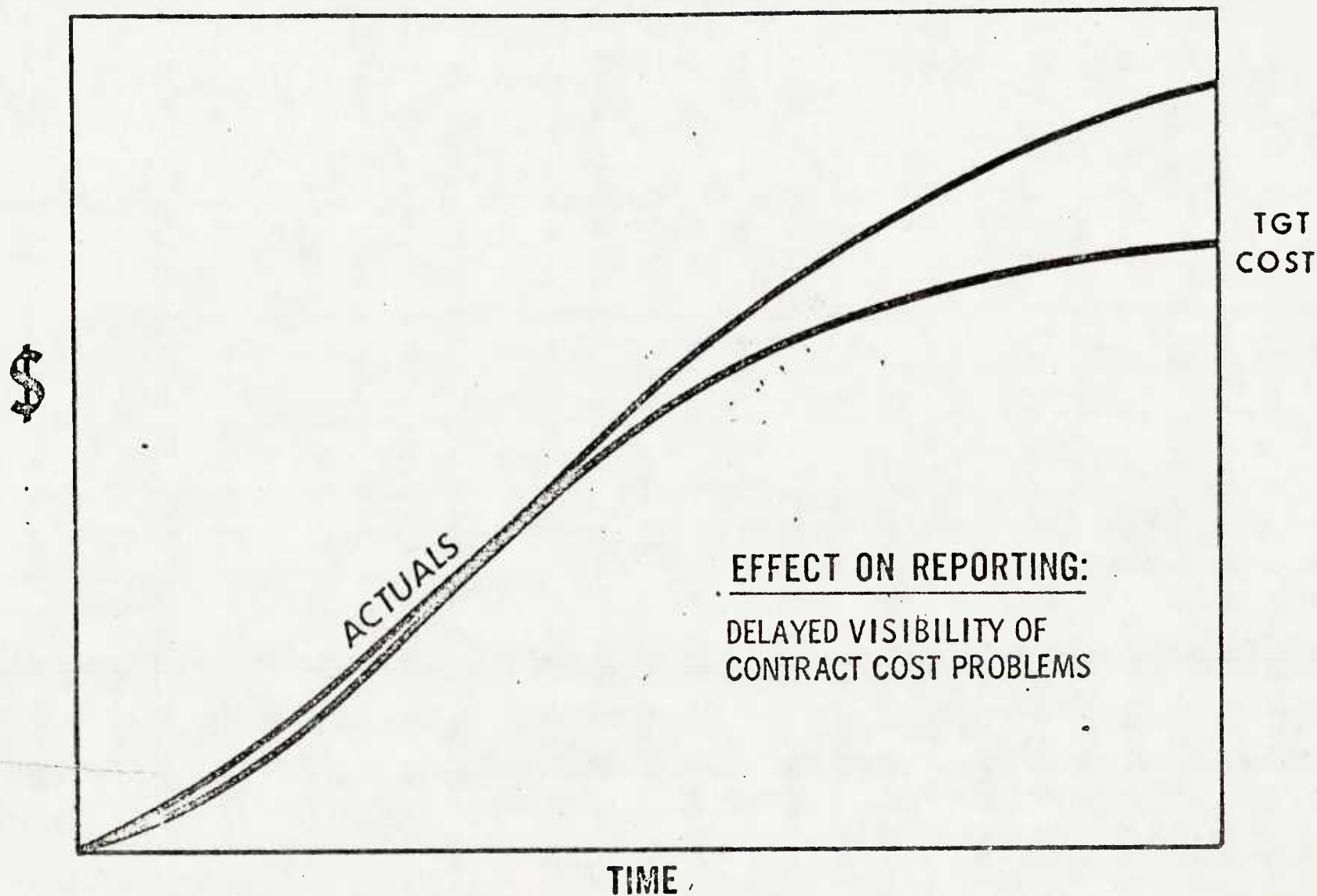
The favorite alternative to increase the estimate was through engineering changes. Most contractors agreed that this system of changes to the baseline was favorable to both contractor management and the end-item technically oriented Government managers. Everyone was aware of "the optimism inherent in the advocacy process that precedes the approval of new system developments".²⁹

The last course of action is budgeting more for control accounts in the beginning of the program than for control accounts in the latter phases of the development. This front loading allows an apparent acceptable contract status until the point where the budgeted figures cannot possibly remain inflated and resolve to the target cost (see exhibit IV. 1). This situation can only happen if there is either a poor price estimate on the work to be accomplished in the latter stages of the contract, or a deliberate attempt on the part of the contractor to mislead the government.

SUBSEQUENT PROBLEMS

Subsequent unforecasted program difficulties can be the result of poor estimating, inefficiencies in operations, or a

²⁹Perry, "System Acquisition Strategies," p. 2.



SOURCE:
OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (COMPTROLLER)

catastrophe like a test aircraft crashing. In any case the internal control will be affected. The research indicated that there were three methods currently being utilized to manage a program difficulty:

1. maintain budget figure for control account
but authorize additional funds for overrun;
2. close out old control account, start a new one;
3. authorize new budget to control account.

Two definitions used by the authors are necessary to understand this section: funding and budgeting. (please refer to Chapter III).

The Contractor Baseline Dilemma

In order to increase a fund figure from the budget of a control account that has had a program difficulty a management decision must be made; additional dollars are required. Control account managers are not allowed to overrun budgets without authorization. Contractor management must authorize budget overruns up to some level. This level has been used as an internal control fund limitation. If a budget overrun is authorized for some justifiable reason, the funds for the control account manager are increased by the budget overrun. The old budget remains the dollar figure for the contract performance measurement baseline. This is the identical phenomenon that occurs in an over optimistic initial cost situation.

The authors observed two ways that this internal control fund has been operationalized. Three contractors studied approve the estimates at completion for the control account managers.

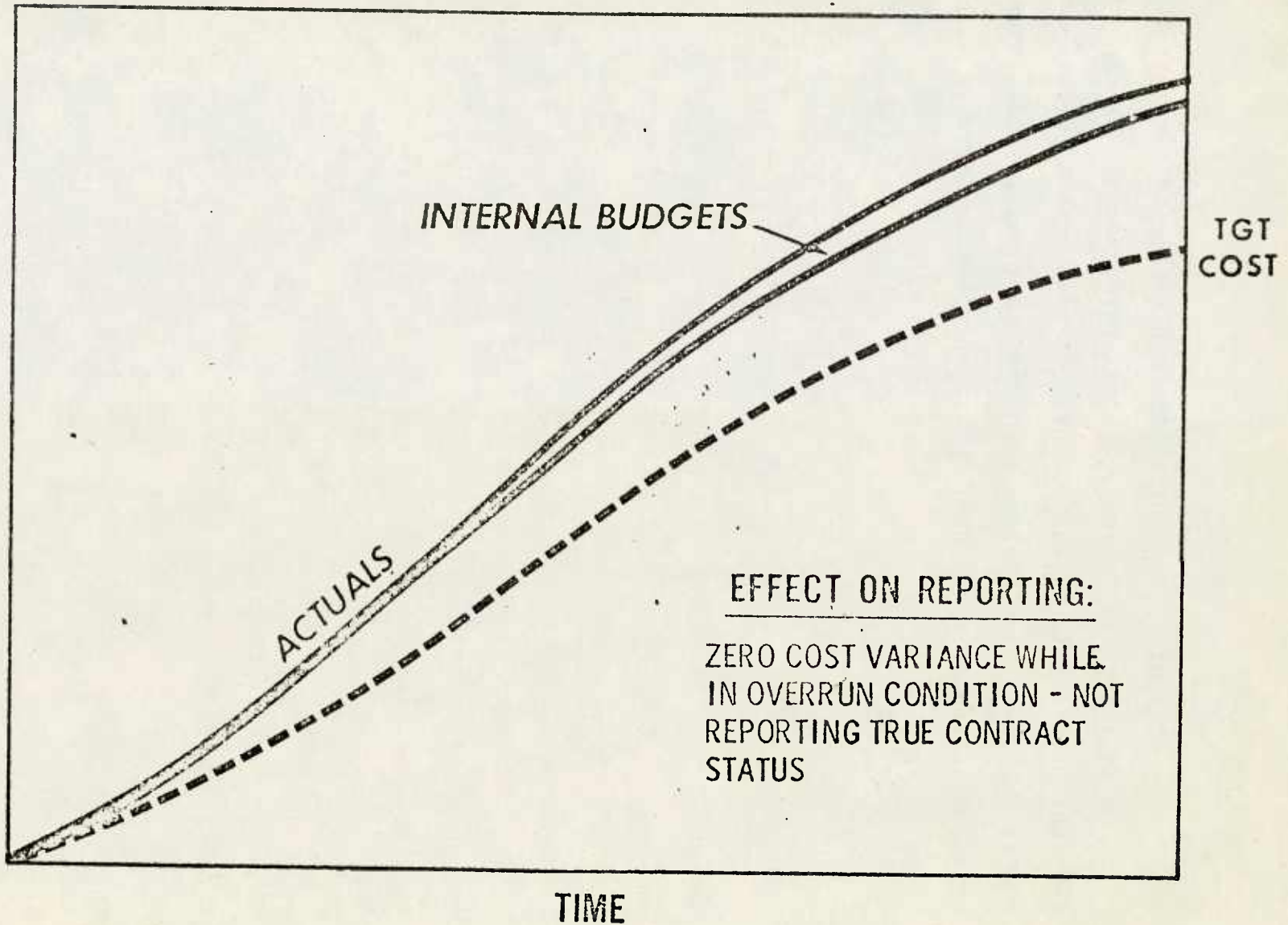
Once a manager receives approval for his new estimate at completion he can spend up to that level. A fourth contractor has an operating budget that is his internal control vehicle. This operating budget is the real fund authorization for expenditures by that control account manager. The operating budget has only a rough resemblance to the original estimate (budget). (exhibit IV. 2). It may be higher or lower than the original estimate.

The second system for handling program difficulties is a close out/reopen system. If a problem develops in a control account, that account is closed and a new one with the work redefined (meaning more funds required) is opened. The additional budget over the budget in the first account comes from management reserve. A negative management reserve is an overrun. In this case the terms budget and funds are used interchangeably.

A third system employed by two contractors is a simple authorization of new budget when a control account begins to exceed its original estimate. This system causes a floating baseline with changes each reporting period.

The authors interpret these funding changes to the estimated budget as a necessary result of the environment of development contracting. In almost all cases contractors stated that it was impossible to accurately estimate the budget for future years, and the contract target cost was a minimum cost at best. We agree.

OVERALLOCATION OF BUDGET



SOURCE:
OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (COMPTROLLER)

CONCLUSION

The present C/SCSC forces the contractor to find other methods to internally measure his own performance. The government gets little actual performance measurement, after MR is fully depleted, unless the government manager understands the subtleties of the actual funding process employed by each respective contractor.

CHAPTER V

INTERPRETATION AND IMPLEMENTATION OF C/SCSC

In the past there has been a considerable difference in interpretation of C/SCSC by the various services. Infact, when the criteria was initially established there had been indifference or resistance to the concept by the Army and Navy.³⁰ The Navy was doubtful that the relatively rigid procedures could be effectively used by a contractor for internal management control. There was the strong possibility that rigid criteria implementation might either result in loss or degradation of contractor internal control, or in the establishment of contract data systems and/or multiple sets of budgets just for generating C/SCSC reports to the government.³¹ Col. Marrella in his study of the effect of C/SCSC on contractor planning and control found that the Air Force demonstration review teams used a long checklist of specific criteria and subcriteria resulting in the fact that none of the eight contractors interviewed were able to survive the demonstration review and achieve validated status on the first attempt.³²

The publication of the Joint Implementation Guide of 31 March 1972 and the frequent meetings of the service focal points have done a great deal to bring a more unified approach and understanding of the criteria. Despite the narrowing of the philosophical gap between the services, our research indicates that some

³⁰J. Ronald Fox, Controlling An Ongoing Project - Part 2 - Contractor Performance Measurement, Harvard Business School, April 1972, p. 25.

³¹Naval Material Command Procurement Newsletter, June 1972.

³²LTC. Marrella, The Effect of the Cost/Schedule Control Systems Criteria (C/SCSC) on Contractor Planning and Control, Washington: DSMS 1973, p. 66.

differences in interpretation of the criteria still exist. We contend there is a continuum from liberal interpretation to a literal strict interpretation. The Navy still embraces the most liberal baseline philosophy, the Army the most rigid and the Air Force, with the largest staff, has a philosophy which varies between the other services depending on the contractor. The Navy advocates an implementation approach which is founded on a precept of encouraging the contractor to develop a sound system of cost and schedule control within his own unique management system. The Plant wide approach is set forth in the Navy Material Command Procurement Newsletter Quarterly Review dated September 1972.

While performance is an important aspect of management control, it alone should not drive the government's interest in a contractor's management control system. Most contractors manage each of the facilities as an entity in matters concerning financial management (including the higher levels of budgeting), accounting, overhead costs, manpower planning and control, and the control of the resources and the work assigned to the major functional organizations. The management control systems in these areas are applied to all the work in the plant. Changes made to these control systems to satisfy the performance measurement should not dominate the review since our interest is assurance of adequate management control plant wide.

In summary, reviews of contractor management control systems should be insufficient depth and scope to identify the contractor's

basic management control systems and to evaluate whether or not they are compatible with compliance with the criteria of 7000.2. By "compatible with the compliance" is meant that only reasonable detail-level modifications or additions to the basic plant wide control systems are needed for complete 7000.2 compliance.

The Army in contrast is more rigid in their interpretation focusing almost exclusively on the system under contract. The Army also tends to be more rigid in baseline interpretation. As an example a contractor facility validated by the Air Force was allowed to reprogram their budget to reflect the new estimate with an override technique. Another facility of the same contractor, validated by the Army, was required to maintain the original budget and not allowed to reprogram. The Air Force was not consistent as we found other programs where they took a rigid position similar to the Army.

It is not within the scope of this paper to attempt to determine if any or all philosophies are correct but to merely point out that in the area of interpretation of the baseline the services do infact continue to differ. It is not surprising to us that differences exist given the questionable value of the original baseline as it is discussed in Chapter IV.

It is our opinion that all services are doing an excellent job of implementation and that the philosophy of each may be necessary to optimize their implementation programs. For example the philosophy of the Navy toward implementation may ease the transition of the shipyards to the C/SCSC system.

COMPARISON OF ENGINEERING DEVELOPMENT AND PRODUCTION IMPLEMENTATION

Engineering Development is viewed by both the contractors and services as the most difficult area for implementation. Engineering contracts by nature have high technical uncertainty and as such are difficult to estimate, plan and budget to discrete work packages or level-of-effort. Most Defense Contractors established their engineering planning and control systems during the post sputnik cost plus environment of the 50's and 60's when technical performance and schedule were the major control criteria. The study done by Peck & Scherer³³ showed cost to be a secondary consideration in most contracts. As contractors move into the era of more visibility and cost control it is difficult for many engineers to accept the fact that they have to work to a budget figure and become responsible for detail planning.

The high uncertainty problem as a result of pushing technology, the continuous replanning as a result of change and the feeling by contractors that the C/SCSC impedes engineers' creativity by budget constraints are the major reasons given for difficulty or resistance to the criteria in the Engineering area.

The production environment is more repetitive and stable than the Engineering environment and as such is more easily adapted to C/SCSC in the eyes of both the Government and the contractors. Most contractors indicated that their pre-C/SCSC production control system came much closer to meeting the criteria than their Engineering system if in fact they utilized an engineering

³³Merton Peck and Frederick Scherer, The Weapons Acquisition Process, Harvard University, 1960, p. 412.

control system at all. In contrast to engineering, production can be described as having specific performance measurement requirements, schedules, repetative material expenditures, usage of standards, application of the learning curves, more conventional functional and organizational relationships, and fewer uncertainties. As a result of the above descriptions contractors normally have work packages of longer duration and have less difficulty with material control.

In the production environment the contractors feel that the Government place the reporting level too low and attempted to force work packages that were too short. Every contractor interviewed stated that for a normal internal system they would report at least one level higher on the matrix and would permit work packages of longer duration.

Production overruns normally occur as a result of rework, or poor estimating. The term rework to the authors includes modifications of the original work schedule for any reason other than an Engineering Change Proposal (ECP). Poor estimating includes inefficiencies as well as an impractical budget from unrealistic estimating. The reaction of contractors to these baseline problems is discussed in Chapter IV.

A requirement of C/SCSC is to record applied direct cost of materials at point of issue, when consumed, or at point of receipt if used within 60 days. This requirement caused much concern to companies that did not have an internal issue and transfer system which met the criteria. Those contractors felt

that the requirement was only of benefit to the Government. Our research indicated that most production oriented companies had an issue and transfer systems which varied from a bill of lading or kitting system to very sophisticated material control systems. At the opposite extreme most R & D oriented companies only tracked material costs at order and receipt points.

Although there is more visibility of cost and schedule performance in production than engineering, production management contributes to a lack of cost consciousness on the part of the employees by giving high priority to fixing technical deficiencies while maintaining delivery schedules. There also seemed to be none or at best, weak incentives for achieving good cost performances except in the contractor experiencing heavy overruns and even then cost was still behind technical priorities.

THE EFFECTS OF CONTRACT CHANGE ON PROGRAM CONTROL³⁴

Despite the fact that thousands of man hours are normally expended by both the Government and contractor by the time a contract is finally negotiated, control of changes represent a major management task. There is a desire by the Government and contractor engineers to stay at the cutting edge of technology and as such contracts can experience almost daily contract changes. Each of these changes can have an effect on cost and schedule control.

³⁴The unpublished research of Professor James Reece titled "The Effects of Contract Changes on the Control of a Major Defense Weapon System Program" represents a major input to the observations of this section.

Contract changes take many forms but the most common is the Engineering Change Proposal (ECP). The actual changes to defense system contracts we group into three classifications: configuration changes, task changes, and program changes. Both configuration changes and task changes are documented by Engineering change proposals. Changes normally cause cost growth. Cost growth differs from overrun in that the cost growth of a contract from the cost of the original contract to the final price is a combination of both change requirements and overruns created by unforeseen technical difficulties and/or contractor inefficiency. Contractor inefficiency is normally due to poor cost control or a poor cost estimate of the original program.

Not all contract changes have a direct impact on cost growth but various studies have shown that 50-75% of contract changes require an upward adjustment in contract price.

Government procurement and controller personnel indicated that the primary problem they face in managing the contract change process is inadequate analysis of the incremental value of changes and the incremental resources required to accomplish the work affected by the changes.

The process by which contract changes costs are negotiated and determined (sometimes after the fact) frequently adds to the difficulty in budget, schedule, and performance baseline control.

Professor Reese, in his detailed research of the effects of contract changes on a major aerospace contractor found that the ability to measure and control performance had impact on both

engineering and production contracts but that there was no reason for changes to disrupt control over non recurring tasks as in engineering. Our research with shipbuilding agrees with this finding. He found that the engineering department could more easily manage change. There were several reasons sighted for this difference between engineering and manufacturing.

First, in the Engineering department the procedures for planning budgeting and cost accumulation are geared to relatively short-term, non-recurring tasks and as such have the capability of evaluating the cost performance at the lowest level of engineering management. It should be noted that although the contractor had the ability to collect engineering hours for ECP's there was resistance to do so because it involved complicating the existing cost accounting system and increasing the department's overhead. The problems increased even more where the changes overlapped. Professor Reese found an additional reason for reluctance on the part of engineering managers to provide ECP cost visibility to be that the reward system was based on "engineering excellence" with an absence of incentives for cost control.

In the manufacturing area, the planning, budgeting and cost accumulation procedures are correlated to longer run, recurring tasks and as such it is difficult if not impossible to measure on control the cost of work required by a change separate from the ongoing manufacturing task. Changes in the production program affect the learning curve and may create impact throughout a large number of production tasks. Charges to the cost account as a

result of changes are normally not identifiable creating a loss of change impact visibility. "While contract changes certainly do not constitute all of the difficulties in effective manufacturing task control, they do represent the incremental barriers which exacerbate control problems to the point of often causing a loss of control over both the basic and the changed task.³⁵

³⁵J. Ronald Fox, Contract Changes, Harvard Business School case 1-673-020, The President and Fellows of Harvard College, 1972.

APPLICATION OF C/SCSC TO SHIPBUILDING

BACKGROUND³⁶

The last ten years have seen the transformation of the PERT/COST system to C/SPCS to the C/SCSC system. C/SPCS was perfected primarily utilizing the aerospace industries contracts for missiles and aircraft. Most of the aerospace industry has accepted C/SCSC and recognized its value. It is our opinion that the next couple of years will see the U.S. shipbuilding industry move through the pains of industry acceptance of the C/SCSC.

Despite progress in technology, new management techniques, and cost reduction programs, United States shipyards are not competitive in the world market. The success of foreign yards in the commercial ship industry is attributable principally to their lower cost of construction.

Factors which have tended to inflate the cost of U.S. construction are variable demand, labor intensiveness, high wage rates, and small quantity custom order for new ships.³⁷

The cyclical characteristic of construction orders has been the most significant cost factor affecting United States shipbuilders. The fluctuation in merchant ship construction has been significantly greater than in naval ship construction in recent years, and as a partial result, most shipyards have concentrated on defense work. However, even in defense contracts only recently has some degree of production stability been achieved

³⁶For a more complete description see Shipbuilding in the United States by Clarey, Nix, and Waldron, Harvard, 1971.

³⁷Shipbuilding Council of America The Annual Report, Washington, Watergate, 1972.

through the awarding of multiple - unit, multi-year contracts.

Because future demand has been uncertain and the past workload has varied considerably, shipbuilders have maintained a low capital to labor ratio to provide a response to fluctuations in orders. As an example of manpower fluctuations, at one shipyard visited the requirements for sheetmetal workers varied in 1973 from 103 to 0 back to 129, with the pattern fluctuating almost week to week. This lower capital to labor ratio has reduced fixed cost of construction but at the same time has resulted in a lower output per manhour because of low morale and high training and start up costs.

In the construction of a commercial carrier up to two-thirds of the work involved processes which lend themselves to mechanization and automation where a sophisticated naval combatant ship with its complex systems has much less opportunity for mechanization.

Another major factor in the relatively high cost of construction of Naval ships has been the lack of simultaneous construction of identical ships as was done with the Victory and Liberty classes during World War II. In the past most merchant and naval construction contracts has involved less than four ships.

The multiple-ship contract provides the construction yard with many economies of scale and can result in the building of a superior ship. Non-recurring costs are spread over a larger number of units thereby lowering the unit cost. The greater the

number of ships in an order, the more likely it is that the yard will be able to obtain larger purchase discounts in the procurement of equipment and outfitting supplies. Finally, multiple-ship production results in increased efficiency through the "learning curve" effect. The application of the learning curve results in savings due to improvements in the efficiencies of labor, management, engineering development, and suppliers.

Another development that can be put to better application in multiple-ship production is modular or semiprefabricated construction. In this, sections of the ship are constructed in the shops complete with all the necessary equipment and piping systems and then transported to the building way for assembly. This type of construction reduces the equipment installation time and presents an opportunity for the compounding of the learning curve since efficiencies develop in the construction of the module and also in the assembly process.³⁸

The past procurement practices of the Navy as a leading customer of United States shipbuilding have not encouraged the economies inherent in volume production and standard design. The construction of naval vessels is authorized and funded annually by the Congress on the basis of programs proposed by the Department of Defense. It has long been the practice of DOD to submit programs which include a wide variety of ship types. To complete a full procurement of a single class of ships, a number of separate annual appropriations programs have been involved and it has been

³⁸"Computers and the Modern Shipyard", Marine Engineering Log, March 1972, p. 7.

Navy practice to place contracts annually for the construction of ships of the year's program.

Recent contract awards, however, for new commercial and naval ships have recognized the cost benefits of multiple-ship construction and design. In reviewing the request for subsidy, the Maritime Administration (MARAD) interceded and was instrumental in having the companies consolidate their design differences into an 11-ship multiple-unit order.

C/SCSC IMPLEMENTATION

Implementation of C/SCSC for construction of ships is difficult not only because of the tendency to build only a few ships on each contract but because Naval shipbuilding contracts are estimated and bid by system and built by unit. NAVSHIPS uses the BUREAU OF SHIPS CONSOLIDATED INDEX (BSCI) as a basis for parametric estimating and contract costing and as such requires the shipyards to submit bid estimates based on the BSCI. As one Government official put it "NAVSHIPS has 175 years of BSCI cost data base and yet has not accurately estimated the cost of a ship contract in 5 years".

This requirement to have the ship cost estimates done by systems in accordance with the BSCI and then to build the ships by compartment, section, or module creates a unique problem for implementation of C/SCSC. At first reading it may seem that this is no different from the aircraft WBS. The difference is that the aircraft WBS is developed to match the production of the aircraft (i.e. wing, aft tail section) while the ship WBS is a

continuation of the system breakdown (i.e. auxiliary systems, electrical plant). The system used in ship construction is a ship breakdown structure (SBS). The SBS normally starts by breaking the ship into sections such as bow, midships, machinery area etc. The SBS is not standard and can be broken down by area, unit, level, or compartment depending on the shipyard and the type of ship. The normal organizational/WBS matrix is simply an organizational/SBS matrix at the work package level.

In order to provide the cost visibility desired at level 3 of the WBS a cross-over matrix from the shipyard's normal SBS oriented cost collect system to the WBS is necessary. Through the use of computers a cross over matrix can be developed which automatically sums to level 3. The problem can certainly be solved but as one shipyard MIS manager said "the C/SCSC system is designed to give good cost visibility but is it really cost-effective to spend an additional million dollars on a two or three ship contract to achieve it?" Although a cross over matrix could be developed at lower WBS levels or at multiple levels the costs appear to increase as the crossing level is lowered.

At this point the solution to the dilemma would seem to simply design a WBS similar to the aerospace industry which parallels the way ships are constructed. Although it is the opinion of the authors that there should be more of a movement toward this goal by NAVSHIPS there are two factors which impede such movement. First, NAVSHIPS and many of the shipyard estimators are familiar and comfortable with the BSCI. Secondly the unit or modular

construction varies from yard to yard and ship to ship. The size of the unit is normally determined or limited by the shipyard crane capacity and as such would vary so greatly that it would be difficult to establish a standard system for building (WBS), or estimating. Several years ago the Maritime Administration attempted to standardize all commercial shipyard estimating procedures and found that the systems were not compatible and as such there was a great deal of resistance on the part of the shipyards to make any changes.

While discussing construction procedures with officials of the Maritime Administration the authors pursued the idea that the Maritime Administration Subsidy Board (See Appendix D) assist the military by requiring a C/SCSC system to be utilized on all subsidy contracts standardizing the cost controls of major shipyards. However, since all commercial contracts are negotiated fixed price and the Merchant Marine Act doesn't provide for imposing reporting requirements, as one MARAD official stated "the Maritime Administration doesn't have to get into that politically explosive area".

All shipyards use the work package approach to shipbuilding so there is little difficulty with the concept of discrete work packages and level of effort. The major shipbuilders also have extensive planning and budgeting systems but tend to differ in how involved the trades become in the process. The two most common methods of defining the work packages are to have a physical breakdown which goes directly from planning to the work package,

or to have the work packages broken down by trade. The budgeting systems also vary from a system whereby the Planning Department determines the manpower requirements and allocates the budget based on standard hours, to a system oriented toward trade planning. It should be pointed out that the estimating department submits the bid for construction on estimates of systems and the planning department determines budgets on unit construction. The trade oriented planning and budget system requires a commitment from the trades which becomes the budget. This system experiences a common problem with C/SCSC implementation in that as the budget flows down from Planning to operations down to the trades the budget commitments are changed at each level. There is a tendency for each level to hold its own management reserve and not identify it back to the contract management reserve.

Another reason why shipbuilders feel that aerospace is more easily adaptable to C/SCSC is that ships are normally built in lots of less than four while aircraft are built in larger lots and on an assembly line basis. Ships normally only have one lead ship in a class where aircraft normally have several prototype models permitting more detail planning, and a larger base to spread the start up costs of planning and developing a cost control system.

Submarines are assembled in a manner closer to the aerospace technology than surface ships. PERT/Cost was developed on the POLARIS PROGRAM. The "SUBSAFE" program requires detailed planning and control over work. This planning is not done on surface vessels. In a surface ship a pipe fitter might install four or five systems

in a compartment without any requirement other than do the job and identify hours spent on each system. This would seem to be a rational requirement but giving the trades a large number of charge numbers to keep track of often results in inaccurate collection of costs by systems - the pipe fitter hours are often budgeted by compartment creating a tendency to only make one charge for time. As one contractor put it "if a worker is required to keep track of more than two charge numbers the result is often loss of system visibility".

As was mentioned in the section on change, the workers have little incentive for insuring that they keep track of their hours for each charge or for achieving good cost control for that matter. It is our opinion that if management were to place more emphasis on proper charge identification for government reporting the workers would be more accurate in their reporting. The workers argument is that his trade is budgeted "X" number of manhours to complete a compartment, being able to identify costs to a system seems unimportant to him.

The submarine SUBSAFE program requires inspection of work by system as such there is a more detailed planning system and a greater system awareness by the workers. Submarine construction has been more continuous and therefore permitted a better trained more evenly distributed manpower loading program.

We feel there are several actions which will reduce problems in implementation of C/SCSC in shipyards. There should be a concerted effort to stretch out construction on the lead ship to

insure all changes are included in the data package for follow-on orders. Changes are expected during engineering development and are more easily tracked than during production. Once construction has started, changes cause a great number of problems. Also changes after the lead ship has been constructed tend to reduce the usefulness of the lead ship data package. The Navy should continue to recognize the value of the multiship contract as well as the possible cost savings from modular construction. As was mentioned earlier NAVSHIPS should begin to move away from the BSCI and toward a system which will permit estimating which more closely corresponds to the way ships are built today. The trend in shipyards today is toward more rigorous control of direct labor as well as improved management control. It will be necessary for the Navy to maintain their present flexible attitude toward implementation of C/SCSC to optimize validation and minimize cost. One Navy shipbuilding contract currently undergoing C/SCSC validation has over ten thousand work packages with 30 unit cross-over points resulting in a difficult implementation.

It is the authors opinion that although there are unique difficulties in the shipbuilding environment the next three years will see these problems solved and the major shipyards validated. Appendix C is an example of one shipbuilder's planning and control program to meet the requirements of C/SCSC.

APPENDIX A



NUMBER 7000.2

DATE April 25, 1972

ASD(C)

Department of Defense Instruction

SUBJECT Performance Measurement for Selected Acquisitions

- Refs: (a) DoD Directive 7000.1, "Resource Management Systems of the Department of Defense," August 22, 1966
(b) DoD Directive 5000.1, "Acquisition of Major Defense Systems" July 13, 1971
(c) Armed Services Procurement Regulation (1969 Edition)
(d) MIL-STD-881, "Work Breakdown Structures for Defense Materiel Items," November 1, 1968
(e) DoD Instruction 7000.2, "Performance Measurement for Selected Acquisitions," December 22, 1967 (hereby cancelled)
(f) AFSCP/AFLCP 173-5, AMCP 37-5, NAVMAT P5240, "Cost/Schedule Control Systems Criteria Joint Implementation Guide," March 31, 1972

I. REISSUANCE AND APPLICABILITY

This Instruction reissues reference (e) and sets forth objectives and criteria, within the purview of references (a) and (b), for the application to selected Defense contracts of uniform DoD requirements for contractors' cost/schedule control systems. The provisions of this Instruction require the use of Cost/Schedule Control Systems Criteria (C/SCSC) in selected acquisitions and apply to all Military Departments and Defense Agencies (hereinafter referred to as DoD Components) which are responsible for acquisitions during systems development and production. Reference (e) is hereby superseded and cancelled.

II. SCOPE

- A. The acquisitions governed by this Instruction are in selected contracts within programs designated as major Defense systems in accordance with reference (b). Firm fixed-price and fixed-price-with-escalation contracts are excluded.
- B. Subcontracts within applicable programs, excluding those that are firm fixed-price, may be selected for application of these criteria by mutual agreement between prime contractors and the contracting DoD Component, according to the criticality of the subcontract to the program. Coverage of certain critical subcontracts may be directed by the DoD, subject to the changes article of the contracts.

III. OBJECTIVE

- A. To provide an adequate basis for responsible decision-making by both contractor management and DoD Components, contractors' internal management control systems must provide data which (1) indicate work progress, (2) properly relate cost, schedule and technical accomplishment, (3) are valid, timely and auditable, and (4) supply DoD managers with information at a practicable level of summarization.
- B. DoD contractors should be continuously alert to advances in management control systems which will improve their internal operations. It is an objective of this Instruction to bring to the attention of, and encourage, DoD contractors to accept and install management control systems and procedures which are most effective in meeting their requirements and controlling contract performance.

IV. POLICY

- A. It shall be the general policy to (1) require application of the C/SCSC as stated in Enclosure 1 to programs that are within the scope of Section II., above, (2) require no changes in contractors' existing cost/schedule control systems except those necessary to meet the C/SCSC, and (3) require the contractor in reporting to the Government to provide performance data directly from the same system used for internal management.
- B. The policies and criteria contained herein will not be construed as requiring the use of specific systems or changes in accounting systems which will adversely affect (1) the equitable distribution of costs to all contracts, or (2) compliance with the standards, rules and regulations promulgated by the Cost Accounting Standards Board.
- C. The applicability of C/SCSC and provisions concerning the acceptability and use of contractors' cost/schedule control systems shall be (1) included in the development concept papers (DCP) leading to the decisions for full-scale development and production, (2) set forth in Requests for Proposal (RFP), and (3) made a contractual requirement in appropriate procurements.
 - 1. Reviews of Systems. To insure compliance with the Cost/Schedule Control Systems Criteria, contractors' systems will be reviewed during various phases of the contracting process. Where the C/SCSC are included as a requirement in the RFP, an Evaluation Review will be performed as an integral part of the source selection process. After contract award, an in-plant Demonstration Review will be made to verify that the contractor is operating systems which meet the criteria.

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Upon successful completion of the Demonstration Review, contractors will not be subjected to reexamination (other than normal surveillance), unless there are positive indications that the contractor's systems no longer meet the criteria. Detailed procedures relating to contractual application, interpretative guidance, interservice relationships, and conduct of systems reviews are contained in the Cost/Schedule Control Systems Criteria Joint Implementation Guide. (Reference (f))

2. Memorandum of Understanding. To avoid multiple demands on contractors for demonstrations of their management systems, a Memorandum of Understanding may be established between the DoD and the contractor to apply to more than one contract.
 - a. The use of a Memorandum of Understanding contemplates the execution of a written instrument which references the C/SCSC and negotiated provisions which (1) reflect an understanding between the contractor and the DoD of the requirements of the DoD criteria, and (2) identify the specific system(s) which the contractor intends to use on applicable contracts with DoD Components.
 - b. The Memorandum of Understanding will include or make reference to a written description of the system(s) validated in a Demonstration Review. The system description should be of sufficient detail to permit adequate surveillance by responsible parties. The use of a Memorandum of Understanding is preferred where a number of separate contracts between one or more DoD Component(s) and the contractor may be entered into during the term of the Memorandum of Understanding. It contemplates the delegation of authority to the DoD Component negotiating the Memorandum of Understanding with the contractor to make the agreement on behalf of all prospective DoD contracting components.
 - c. Action to develop a Memorandum of Understanding may be initiated by either the contractor or the DoD Component, but will usually be in connection with a contractual requirement. Reference to a Memorandum of Understanding satisfies the C/SCSC requirement in RFP's and normally obviates the need for further Evaluation or Demonstration Reviews. Procedures for executing Memorandums of Understanding are included in the Cost/Schedule Control Systems Criteria Joint Implementation Guide.

3. Surveillance. Recurring evaluations of the effectiveness of the contractor's policies and procedures will be performed to insure that the contractor's system continues to meet the C/SCSC and provides valid data consistent with the intent of this Instruction. Surveillance reviews will be based on selective tests of reported data and periodic evaluations of internal practices during the life of the contract.

V. RESPONSIBILITIES

Pursuant to authority contained in DoD Directive 7000.1 (reference (a)):

- A. The Assistant Secretary of Defense (Comptroller) will establish policy guidance pertaining to the Cost/Schedule Control Systems Criteria and will monitor their implementation to insure consistent application throughout the Department of Defense.
- B. The Secretaries of the Military Departments will issue appropriate instructions which promulgate the policies contained herein and which assign responsibilities for accomplishing the actions required to validate contractors' compliance with the C/SCSC.
- C. The Joint Logistics Commanders will develop and issue joint implementing instructions which outline the procedures to be used in applying, testing and monitoring the C/SCSC on applicable contracts and will insure that adequate reviews of contractors' systems are performed. The joint implementing procedures and their revisions will be coordinated among all affected DoD Components and submitted to ASD(C) for review prior to publication.
- D. The Defense Contract Audit Agency and the appropriate Contract Administration Service office will participate in reviews of contractors' systems under their cognizance and will perform required surveillance, collaborating with each other and with the procuring DoD Component in reviewing areas of joint interest.

VI EFFECTIVE DATE AND IMPLEMENTATION

This Instruction is effective immediately. Two copies of the implementing documents will be forwarded to the ASD(C) within 60 days.

R.C. Moot

Assistant Secretary of Defense
(Comptroller)

Enclosure

COST/SCHEDULE CONTROL SYSTEMS CRITERIA

1. GENERAL

a. Any system used by the contractor in planning and controlling the performance of the contract shall meet the criteria set forth in 3., below. Nothing in these criteria is intended to affect the basis on which costs are reimbursed and progress payments are made, and nothing herein will be construed as requiring the use of any single system, or specific method of management control or evaluation of performance. The contractor's internal systems need not be changed, provided they satisfy these criteria.

b. An element in the evaluation of proposals will be the proposer's system for planning and controlling contract performance. The proposer will fully describe the system to be used. The prospective contractor's cost/schedule control system proposal will be evaluated to determine that it meets these criteria. The prospective contractor will agree to operate such a system throughout the period of contract performance if awarded the contract. The DoD will agree to rely on the contractor's system and therefore will not impose a separate planning and control system.

2. DEFINITIONS

a. Actual Direct Costs. Those costs identified specifically with a contract, based upon the contractor's cost identification and accumulation system as accepted by the cognizant DCAA representatives.

b. Applied Direct Costs. The amounts recognized in the time period associated with the consumption of labor, material, and other direct resources, without regard to the date of commitment or the date of payment. Under this term, certain material costs are considered as applied when the articles are received even though temporarily stored in inventory areas so long as these costs meet the accounting criteria and the cost of Government furnished material is excluded.

c. Apportioned Effort. Effort that by itself is not readily divisible into short-span work packages but which is related in direct proportion to work packages.

d. Authorized Work. That effort which (1) has been definitized and is on contract and (2) that for which definitized contract prices have not been agreed to but for which written authorization has been received.

e. Baseline

(1) Contract Budget Baseline. This will equal the negotiated contract cost plus the estimated cost for Government authorized changes. For authorized but unpriced work, interim budgets will be used in the contract budget baseline until firm budgets can be prepared.

(2) Performance Measurement Baseline. The time-phased budget plan against which contract performance is measured consisting of budgets assigned in scheduled cost accounts. It will reconcile directly to the contract budget baseline.

f. Budgeted Costs

(1) Budgeted Cost for Work Scheduled. The sum of the budgets for work packages scheduled to be accomplished (including in-process work packages), plus the amount of level of effort and apportioned effort scheduled to be accomplished within a given time period.

(2) Budgeted Cost for Work Performed. The sum of the budgets for completed work packages and completed portions of open work packages, plus budgets for level of effort (LOE) and apportioned effort activity completed.

(3) Work Package Budgets. These may be expressed in dollars, hours, standards, or other definitive units which are formally assigned by the contractor to accomplish a specific task or group of tasks.

g. Cost Control Account. A point at which actual costs can be accumulated and compared to budgeted cost for work performed. A natural control point for cost/schedule planning and control formed by the intersection of the organizational structure and the contract work breakdown structure (WBS). The term "cost account" used herein is synonymous with this definition.

h. Direct Costs. See ASPR 15-202.

i. Estimated Cost at Completion. Actual direct costs, plus indirect costs allocable to the contract, plus the estimate of costs for authorized work remaining.

j. Indirect Costs. See ASPR 3-701.3 and 15-203.

k. Level of Effort (LOE). That activity which cannot be associated with a definable end product or result and is controllable by time-phased budgets established for that purpose.

l. Management Reserve. An amount of the overall contract budget withheld for management control purposes rather than for the accomplishment of a specific task or set of tasks.

m. Negotiated Contract Cost. The estimated cost negotiated in a cost-plus-fee contract or the negotiated contract target cost in either a fixed price incentive contract or a cost-plus-incentive fee contract.

n. Operating or Performing Organizations. A defined unit within the contractor's organization structure which actually performs the work.

o. Original Budget. The budget established at, or near, the time the contract was signed, and consistent with the negotiated contract cost.

p. Undistributed Budget. Budget identified to a task but not yet assigned to a responsible organization.

q. Responsible Organization. A defined unit within the contractor's organization structure which is assigned responsibility for accomplishing specific tasks.

r. Significant Variances. Those differences between planned and actual performance which require further review, analysis, or action. Appropriate thresholds should be established for variance analyses.

s. Work Breakdown Structure. A product-oriented family tree division of hardware, software, services, and other work tasks which organizes, defines and graphically displays the product to be produced as well as the work to be accomplished to achieve the specified product.

(1) Project Summary Work Breakdown Structure. A summary WBS tailored to a specific defense material item by selecting applicable elements from one or more summary WBS's or by adding equivalent elements unique to the project (MIL-STD-881, reference (d)).

(2) Contract Work Breakdown Structure (CWBS). The complete WBS for a contract, developed and used by a contractor in accordance with MIL-STD-881 and the contract work statement. The CWBS comprises the selected project summary WBS elements included in the contract and those extensions by the contractor which cover the lower levels of the WBS.

t. Work Packages. Detailed short-span jobs, or purchased material items, identified by the contractor for accomplishing work required to complete the contract. A work package has the following characteristics:

(1) It represents units of work at levels where work is performed.

- (2) It is clearly distinguished from all other work packages.
- (3) It is assignable to a single organizational element.
- (4) It has scheduled start and completion dates which are representative of physical accomplishment.
- (5) It has a budget or assigned value expressed in terms of dollars, manhours, or other measurable units.
- (6) Its size and duration are limited to relatively short spans of time to minimize the work in process effort.
- (7) It is integrated with detailed engineering, manufacturing, or other schedules.

3. CRITERIA

The contractors' management control systems will include policies, procedures, and methods which are designed to ensure that they will accomplish the following:

a. Organization

- (1) Define all authorized work and related resources to meet the requirements of the contract, using the framework of the CWBS.
- (2) Identify the internal organizational elements and the major subcontractors responsible for accomplishing the authorized work.
- (3) Provide for the integration of the contractor's planning, scheduling, budgeting, work authorization and cost accumulation systems with each other, the CWBS, and the organizational structure.
- (4) Identify the managerial positions responsible for controlling overhead (indirect costs).
- (5) Provide for integration of the CWBS with the contractor's functional organizational structure in a manner that permits cost and schedule performance measurement for CWBS and organizational elements.

b. Planning and Budgeting

- (1) Schedule the authorized work in a manner which describes the sequence of work and identifies the significant task interdependencies required to meet the development, production and delivery requirements of the contract.
- (2) Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure output.

(3) Establish and maintain a time-phased budget baseline at the cost account level against which contract performance can be measured. Initial budgets established for this purpose will be based on the negotiated target cost. Any other amount used for performance measurement purposes must be formally recognized by both the contractor and the Government.

(4) Establish budgets for all authorized work with separate identification of cost elements (labor, material, etc.).

(5) To the extent the authorized work can be identified in discrete, short-span work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire cost account cannot be subdivided into detailed work packages, identify the far term effort in larger planning packages for budget and scheduling purposes.

(6) Provide that the sum of all work package budgets plus planning packages within a cost account equals the cost account budget.

(7) Identify relationships of budgets or standards in underlying work authorization systems to budgets for work packages.

(8) Identify and control LOE activity by time-phased budgets established for this purpose. Only that effort which cannot be identified as discrete, short-span work packages or as apportioned effort will be classed as LOE.

(9) Establish overhead budgets for the total costs of each significant organizational component whose expenses will become indirect costs. Reflect in the contract budgets at the appropriate level the amounts in overhead pools that will be allocated to the contract as indirect costs.

(10) Identify management reserves and undistributed budget.

(11) Provide that the contract target cost plus the estimated cost of authorized but unpriced work is reconciled with the sum of all internal contract budgets and management reserves.

c. Accounting

(1) Record direct costs on an applied or other acceptable basis consistent with the budgets in a formal system that is controlled by the general books of account. Where an applied direct cost basis is used, include within the cost accounts the amounts charged to work in process in the time period when:

(a) Labor, material, and other direct resources are actually consumed; or

(b) Material resources are withdrawn from inventory for use; or

(c) Material resources are received that are uniquely identified to the contract and scheduled for use within 60 days; or

(d) Major components or assemblies are received on a line flow basis that are specifically and uniquely identified to a single serially numbered end item.

(2) For some applications, actual costs for material recorded on other than an applied direct cost basis may be accepted. When used, the contractor's material accounting system must facilitate performance measurement and determination of unit or lot costs when applicable. They must provide for price variance determination; usage variance determination; accurate cost accumulation and assignment of costs to cost accounts in a manner consistent with the budgets using recognized, acceptable costing techniques; and material accountability.

(3) Summarize direct costs from cost accounts into the WBS without allocation of a single cost account to two or more WBS elements.

(4) Summarize direct costs from the cost accounts into the contractor's functional organizational elements without allocation of a single cost account to two or more organizational elements.

(5) Record all indirect costs which will be allocated to the contract.

(6) Identify the bases for allocating the cost of apportioned effort.

(7) Identify unit costs, equivalent unit costs, or lot costs as applicable.

d. Analysis

(1) Identify at the cost account level on a monthly basis using data from, or reconcilable with, the accounting system:

(a) Budgeted cost for work scheduled and budgeted cost for work performed.

(b) Budgeted cost for work performed and applied (actual where appropriate) direct costs for the same work.

(c) Variances resulting from the above comparisons classified in terms of labor, material, or other appropriate elements together with the reasons for significant variances.

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(2) Identify on a monthly basis, in the detail needed by management for effective control, budgeted indirect costs, actual indirect costs, and variances along with the reasons.

(3) Summarize the data elements and associated variances listed in (1) and (2) above through the contractor organization and WBS to the reporting level specified in the contract.

(4) Identify significant differences on a monthly basis between planned and actual schedule accomplishment and the reasons.

(5) Identify managerial actions taken as a result of criteria items (1) through (4) above.

(6) Based on performance to date and on estimates of future conditions, develop revised estimates of cost at completion for WBS elements identified in the contract and compare these with the contract budget baseline and the latest statement of funds requirements reported to the Government.

e. Revisions and Access to Data

(1) Incorporate contractual changes in a timely manner recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the functional organizations.

(2) Reconcile original budgets for those elements of the work breakdown structure identified as priced line items in the contract, and for those elements at the lowest level of the DoD Project Summary WBS, with current performance measurement budgets in terms of (a) changes to the authorized work and (b) internal replanning in the detail needed by management for effective control.

(3) Prohibit retroactive changes to records pertaining to work performed that will change previously reported amounts for direct costs, indirect costs, or budgets, except for correction of errors and routine accounting adjustments.

(4) Prevent revisions to the contract budget baseline (paragraph 2.e.(1)) except for Government directed changes to contractual effort or changes resulting from formal reprogramming.

(5) Document, internally, changes to the performance measurement baseline and, on a timely basis, notify the procuring activity through prescribed procedures.

(6) Provide the contracting officer and his duly authorized representatives access to all of the foregoing information and supporting documents.

APPENDIX B



Department of Defense Instruction

SUBJECT**Contract Cost Performance and Funds Status Report**

Refs.: (a) through (i), see Enclosure 1

I. REISSUANCE AND PURPOSE

- A. This Instruction consolidates the provisions of references (g), (h) and (i) into a single document. References (g), (h) and (i) are hereby superseded and cancelled.
- B. This Instruction assigns responsibilities and provides uniform guidance for implementation of the Cost Performance Report (CPR) and the Contract Funds Status Report (CFSR).
- C. The CPR and CFSR provide means to collect summary level cost and schedule performance data and funding data from contractors for program management purposes pursuant to DoD Directive 7000.1 (reference (a)) and DoD Directive 5000.1 (reference (b)) and for responding to requests for program status information on major defense systems, primarily by means of the Selected Acquisitions Report (reference (d)). Specifically:
 1. The CPR is intended to provide early identification of problems having significant cost impact, effects of management actions taken to resolve existing problems, and program status information for use in making and validating management decisions.
 2. The CFSR is intended to supply funding data that, with other performance measurement inputs, provides DoD management with information to assist in: (a) updating and forecasting contract fund requirements, (b) planning and decision-making on funding changes, (c) developing fund requirements and budget estimates in support of approved programs, and (d) determining funds in excess of contract needs and available for deobligation.

II. APPLICABILITY

The provisions of this Instruction apply to all DoD Components (Military Departments, Defense Agencies, Unified and Specified Commands) responsible for (a) managing major defense systems falling within the scope of subsection III.A., below, and (b) determining fund requirements for contracts and managing the flow of such funds.

III. SCOPE

The Cost Performance Report (CPR) will be applied to selected contracts within programs designated as major defense systems in accordance with DoD Directive 5000.1 (reference (b)). The Contract Funds Status Report is normally applicable to all contracts of over \$500,000 in value.

A. Cost Performance Report

1. CPR will not be required on firm fixed-price contracts unless those contracts represent the development or production of a major defense system, a major component thereof, or programs of special interest to the DoD or the Congress.
2. The CPR is applicable to on-going contracts only in those cases where the procuring agencies consider it necessary to support program management needs and DoD requirements for information. Some of the factors which may affect applications to on-going contracts are anticipated time to contract completion, anticipated program deferrals, and the relative importance of subcontracts.

B. Contract Funds Status Report

1. CFSR may be implemented at a reduced level of reporting for: (a) those contracts with a dollar value between \$100,000 and \$500,000, (b) Time and Material contracts, and (c) contractual effort for which the entire CFSR report is not required by the procuring activity, but limited funding requirements information is needed.
2. CFSR will not be required on: (a) firm fixed-price contracts as defined in Section 3-404.2 of the Armed Services Procurement Regulation (reference (f)), except for unpriced portions of such contracts (e.g., spares, support equipment, publications, engineering change orders, etc.) that individually or collectively are estimated by the Government to be in excess of twenty (20) percent of the initial contract value, (b) contracts with a total value of less than \$100,000, (c) contracts expected to be completed within six months, and (d) facilities contracts. With respect to item (a), above, the contract will delineate the specific CFSR requirements, if any, to be imposed on the contractor, to fit the circumstances of each particular case.

10. Preparation Instructions (Continued)

3. Format 1 - Work Breakdown Structure:

a. Signature, Title and Date: The contractor's authorized representative will sign the report and enter his title and the date of signature.

b. Quantity: Enter the number of prime items to be procured under the current contract, if applicable.

c. Negotiated Cost: Enter the dollar value (excluding fee or profit) on which contractual agreement has been reached as of the cut-off date of the report. For a fixed-fee contract, enter the estimated cost negotiated. For an incentive contract, enter the definitized contract target cost. Amounts for changes will not be included in this item until they have been priced and incorporated in the contract through supplemental agreement.

d. Estimated Cost of Authorized, Unpriced Work: Enter the amount (excluding fee or profit) estimated for that work for which written authorization has been received, but for which definitized contract prices have not been agreed to.

e. Target Profit/Fee %: Enter the fee or percentage of profit which will apply if the target/estimated cost of the contract (subparagraph c., above) is met.

f. Target Price: Enter the target price (negotiated contract cost plus profit/fee) applicable to the definitized contract effort.

g. Estimated Price: Based on the latest revised estimate of cost at completion for all authorized contract work and the appropriate profit/fee, incentive, and cost sharing provisions, enter the estimated contract price (total estimated cost to the Government).

h. Share Ratio: Enter the cost sharing ratio(s) applicable to costs over/under the negotiated contract cost.

i. Contract Ceiling: Enter the contract ceiling price applicable to the definitized effort.

j. Estimated Ceiling: Enter the estimated ceiling price applicable to all authorized contract effort including both definitized and undefinitized effort.

k. Column (1) - Item

(1) Work Breakdown Structure: Enter the noun description of the WBS item for which cost information is being reported. WBS items or levels reported will be those specified in the contract.

(2) General and Administrative (G&A): Enter in Columns (2) through (14) the appropriate General and Administrative costs. If G&A has been included in the total costs reported above, G&A will be shown as a non-add entry on this line with an appropriate notation. If a G&A classification is not used, no entry will be made other than an appropriate notation to that effect.

(3) Undistributed Budget: Enter in Columns (12) and (13) the amount of budget applicable to contract effort which has not yet been identified to WBS elements at or below the reporting level. For example, contract changes which were authorized late in the reporting period should have received a total budget, however, assignment of work and allocation of budgets to individual WBS elements may not have been accomplished as of the end of the period. Budgets which can be identified to WBS elements at or below the specified reporting level will be included in the total budgets shown for the WBS elements in the body of the report and will not be shown as undistributed budget. All undistributed budget will be fully explained in the narrative analysis section of the report (Format 5).

NOTE: The provisions made in this report for undistributed budget are primarily to accommodate temporary situations where time constraints prevent adequate budget planning or where contract effort can only be defined in very general terms. Undistributed budget should not be used as a substitute for adequate contract planning. Formal budgets should be allocated to contract effort and functional organizations at the earliest possible time, normally within the next reporting period.

(4) Subtotal: Enter the sum of the direct, indirect and G&A costs and budgets in Columns (2) through (14). In Columns (12) and (13) also add the undistributed budget.

(5) Management Reserve: An amount of the overall contract budget withheld for management control purposes rather than for the accomplishment of a specific task or set of tasks. In Columns (12) and (14) enter the remaining amount of budget identified as management reserve as of the end of the current reporting period. Amounts of management reserve applied to WBS elements during the reporting period will be explained in the narrative analysis on Format 5.

(6) Total: Enter the sum of all direct, indirect, General and Administrative costs, undistributed budgets and management reserves in Columns (2) through (14).

(7) Variance Adjustment: In exceptional cases, the procuring agency may authorize the contractor to establish baseline budgets which in total exceed the negotiated contract cost plus the estimated cost for authorized-unpriced work. Since the body of this report simply displays performance status against the most current budget baseline, it is possible for the total cost and schedule variances on a contract to be obscured if the contractor has used a portion of the additional budget to eliminate variances applicable to completed work. If variance adjustments of this type are made, the applicable amounts will be shown on this line by entering the total adjustments to the schedule and cost variances in Columns (10) and (11).

(8) Total Variance: Enter the sum of the cost and schedule variances (Columns (10) and (11)) shown on the Total line and on the Variance Adjustment line in the spaces provided under Columns (10) and (11). In Column (12) enter the sum of the negotiated contract cost plus the estimated cost for authorized, unpriced work. In Column (13) enter the latest revised estimate of cost at completion. In Column (14) enter the difference between Columns (12) and (13).

DATA ITEM DESCRIPTION		2. IDENTIFICATION NO(S)	
		AGENCY	NUMBER
1. TITLE Cost Performance Report (CPR)		OSD	DI-F-6000A
3. DESCRIPTION/PURPOSE This report is prepared by contractors and consists of five formats containing cost and related data for measuring contractors' cost and schedule performance. Format 1 provides data to measure cost and schedule performance by summary level work breakdown structure elements. Format 2 provides a similar measurement by organizational or functional cost categories. Format 3 provides the budget baseline plan against which performance is measured. Format 4 provides manpower loading forecasts for correlation with the budget (Continued on page 2)		4. APPROVAL DATE Dec. 15, 1972	
		5. OFFICE OF PRIMARY RESPONSIBILITY OASD(C)	
		6. DOC REQUIRED	
		7. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP The CPR will normally be required for selected contracts within those programs designated as major programs in accordance with DoD Directive 5000.1, "Acquisition of Major Defense Systems," dated 13 July 1971. It will be established as a contractual requirement as set forth in the DD Form 1423 Contract Data Requirements List (CDRL), and DD Form 1660, Management System Summary List. If the CPR supports a contractual requirement for contractor compliance with the Cost/Schedule Control Systems Criteria (C/SCSC), the CPR data elements will reflect the contractor's implementation in accordance with DoDI 7000.2. If compliance with the C/SCSC is not contractually required, the data elements to be reported on the CPR will be as specified in the solicitation document or as subsequently negotiated. (Continued on page 2)		9. REFERENCES (Mandatory as cited in block 10) MIL STD 881 DoDI 7000.2 DoDI 7000.6 DoDI 7000.8 DoDI 7041.2	
10. PREPARATION INSTRUCTIONS		MCBL NUMBER(S) 79023	
<p>1. Hard copy printouts from contractors' internal mechanized reporting systems may be substituted for CPR formats provided the printouts contain all the required data elements at the specified reporting levels in a form suitable for management use. If CPR formats are used, they will be completed in accordance with the following instructions.</p> <p>2. <u>Heading Information - Formats 1 through 4</u></p> <p>a. <u>Contractor Name and Location</u>: Enter the name, division if applicable, plant location and mailing address of the reporting contractor.</p> <p>b. <u>RDT&E</u> <input type="checkbox"/> <u>Production</u> <input type="checkbox"/>: Check appropriate box. Separate reports are required for each type of effort.</p> <p>c. <u>Contract Type/Number</u>: Enter the contract type, contract number and the number of the latest contract change or supplemental agreement applicable to the contract.</p> <p>d. <u>Program Name or Number</u>: Enter the program name, number, acronym and/or the type, model and series or other designation of the prime items purchased under the contract.</p> <p>e. <u>Report Period</u>: Enter the beginning and ending dates of the period covered by the report.</p> <p>f. <u>Security Classification</u>: Enter the appropriate security classification.</p> <p>(Continued on pages 3 - 8)</p>			

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3. Description/Purpose (Continued)

plan and cost estimate predictions. Format 5 is a narrative report used to explain significant cost and schedule variances and other identified contract problems. The data will be used by DoD program/project managers to: (a) evaluate contract performance, (b) identify actual and potential problem areas having significant cost impact, and (c) provide valid, timely program status information to higher headquarters.

7. Application/Interrelationship (Continued)

Unless otherwise provided for in the contract (CDRL-DD Form 1423), the CPR will normally be required on a monthly basis and submitted to the procuring activity no later than twenty-five (25) calendar days following the reporting cut-off date. Reports may reflect data either as-of-the-end-of-the-calendar-month or as of the contractor's accounting period cut-off date.

Data reported in the CPR will pertain to all authorized contract work, including both priced and unpriced effort. The level of detail to be reported will normally be limited to level three of the Contract Work Break-down Structure or higher, except when a problem area is indicated at a lower level of the WBS, in which case more detailed data will be provided until the problem is resolved.

Certain aspects of the report are subject to negotiation between the Government and the contractor, such as:

(a) The specific variance thresholds which, if exceeded, require problem analysis and narrative explanations.

(b) The organizational or functional categories to be reported on Formats 2 and 4.

(c) The specific time increments to be used for the manpower loading and baseline projections required by Formats 3 and 4.

(d) The reporting provisions which apply if C/SCSC are not contractually required.

In all cases, the CPR is subject to "tailoring" to require less data in accordance with the provisions of DoD Instruction 7000.6. All negotiated reporting provisions will be specified in the contract, including the reporting frequency and the WBS elements to be reported.

C. CPR and CFSR

1. In concert with the policies established in DoD Directive 5000.1 (reference (b)), utilization of the CPR and CFSR shall be exercised by program managers to achieve essential management control.
 - a. Contractors are encouraged to substitute internal reports for CPR and CFSR provided that data elements and definitions used in the reports are synonymous with CPR and CFSR requirements and that the reports are in a form suitable for management use.
 - b. As applicable, provisions of DoD Instruction 7000.6 (reference (e)) concerning the tailoring of a management system may be employed by program managers in the implementation of CPR and CFSR.
2. Instructions regarding the level of detail and the frequency of reporting for the CPR and CFSR are contained in Data Item Descriptions (DD Form 1664) DI-F-6000A, Cost Performance Report (CPR) and DI-F-6004A, Contract Funds Status Report (CFSR), Enclosures 2 and 3 to this Instruction. Local reproduction of formats contained in these Enclosures is authorized.

IV. RESPONSIBILITIES

A. DoD Components will assure that:

1. Contractor reports are timely and submitted in accordance with the instructions contained in Enclosures 2 and 3.
2. Submitted data are checked for discrepancies and necessary corrections are furnished by contractors.
3. Application of the CPR to on-going programs or firm fixed-price contracts is held to the minimum essential to support program management needs and DoD requirements for information.
4. Controls are established to insure, upon contractual application of the CPR and CFSR, that "program-peculiar" reports used to collect similar cost and schedule performance and funding information are superseded by the CPR and CFSR.
5. Requirements for data to be collected from contractors will at all times be held to the minimum essential to support necessary and specific management requirements.

B. The appropriate Defense Contract Audit Agency (DCAA) office will:

1. At the request of a DoD Component, provide advice as to whether the contractor's procedures are adequate and reliable for CPR and CFSR purposes at the time of evaluation of the contractor's accounting system on the preaward survey. DCAA will also make reviews of selected CPR and CFSR reports when they consider it necessary to assure the continuing adequacy and reliability of procedures and the validity of reported data.
2. Review selected individual CPR and CFSR reports when requested by the Procuring Contracting Officer (PCO) or Administrative Contracting Officer (ACO) and submit a report thereon.

V. EFFECTIVE DATE AND IMPLEMENTATION

This Instruction is effective immediately. Two copies of implementing documents shall be forwarded to the Assistant Secretary of Defense (Comptroller) within 90 days.

R. C. Moot

Assistant Secretary of Defense
(Comptroller)

Enclosures - 3

1. References
2. DD Form 1664, DI Number DI-F-6000A,
Cost Performance Report (CPR)
3. DD Form 1664, DI Number DI-F-6004A,
Contract Funds Status Report (CFSR)

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Enclosure 1

References

- (a) DoD Directive 7000.1, "Resource Management Systems of the Department of Defense," August 22, 1966
- (b) DoD Directive 5000.1, "Acquisition of Major Defense Systems," July 13, 1971
- (c) DoD Instruction 7000.2, "Performance Measurement for Selected Acquisitions," April 25, 1972
- (d) DoD Instruction 7000.3, "Selected Acquisition Reports (SAR)," September 13, 1971
- (e) DoD Instruction 7000.6, "Acquisition Management Systems Control," March 15, 1971
- (f) Section 3-404.2 of the Armed Services Procurement Regulation (1969)
- (g) DoD Instruction 7000.8, "Cost Performance Report (CPR)," April 1, 1970 (hereby cancelled)
- (h) DoD Instruction 7800.7, "Contract Funds Status Report (CFSR)," December 23, 1966 (hereby cancelled)
- (i) ASD (Comptroller) memorandum, "Implementation of the Revised DD Form 1586, 'Contract Funds Status Report (CFSR),' " January 7, 1972 (hereby cancelled)

CONTRACTOR:		COST PERFORMANCE REPORT - WORK BREAKDOWN STRUCTURE						SIGNATURE, TITLE & DATE		FORM APPROVED			
LOCATION:		CONTRACT TYPE / NO.:		PROGRAM NAME/NUMBER		REPORT PERIOD:				OMB NUMBER			
ROTAE <input type="checkbox"/> PRODUCTION <input type="checkbox"/>										22R0280			
QUANTITY	NEGOTIATED COST	EST COST AUTH, UNPRICED WORK		TGT PROFIT/FEE %	TGT PRICE	EST PRICE	SHARE RATIO	CONTRACT CEILING	EST CEILING				
ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED	LATEST REVISED ESTIMATE	VARIANCE
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<u>WORK BREAKDOWN STRUCTURE</u>													
GEN AND ADMIN													
UNDISTRIBUTED BUDGET													
SUBTOTAL													
MANAGEMENT RESERVE													
TOTAL													
RECONCILIATION TO CONTRACT BUDGET BASELINE													
VARIANCE ADJUSTMENT													
TOTAL CONTRACT VARIANCE													
(ALL ENTRIES IN THOUSANDS OF DOLLARS)													

CONTRACTOR:		COST PERFORMANCE REPORT - FUNCTIONAL CATEGORIES										FDRM APPROVED	
LOCATION		CONTRACT TYPE / NO.:				PROGRAM NAME/NUMBER:				REPORT PERIOD:		OMB NUMBER	
RDT&E <input type="checkbox"/> PRODUCTION <input type="checkbox"/>												22R0280	
ORGANIZATIONAL OR FUNCTIONAL CATEGORY	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL CDST WORK PERFORMED	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED	LATEST REVISED ESTIMATE	VARIANCE
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
GEN AND ADMIN													
UNDISTRIBUTED BUDGET													
TOTAL													
Note: This total must agree with Subtotal on Format 1. (ALL ENTRIES IN THOUSANDS OF DOLLARS)													

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CONTRACTOR:		COST PERFORMANCE REPORT - BASELINE										FORM APPROVED	
LOCATION:		CONTRACT TYPE/NO.:				PROGRAM NAME/NUMBER				REPORT PERIOD:		OMB NUMBER	
RDT&E <input type="checkbox"/> PRODUCTION <input type="checkbox"/>												22R0280	
(1) ORIGINAL CONTRACT TARGET COST	(2) NEGOTIATED CONTRACT CHANGES	(3) CURRENT TARGET COST (1) + (2)	(4) ESTIMATED COST OF AUTHORIZED, UNPRICED WORK	(5) CONTRACT BUDGET BASELINE (3) + (4)	(6) TOTAL ALLOCATED BUDGET	(7) DIFFERENCE (5) - (6) (SEE PAGE 5)							
BUDGETED COST FOR WORK SCHEDULED (NON-CUMULATIVE)													
ITEM (1)	DCWS CUM TO DATE (2)	SIX MONTH FORECAST						(ENTER SPECIFIED PERIODS)				TOTAL BUDGET (14)	
		+ 1 (3)	+ 2 (4)	+ 3 (5)	+ 4 (6)	+ 5 (7)	+ 6 (8)	(9)	(10)	(11)	(12)		(13)
PM BASELINE (BEGINNING OF PERIOD)													
(LIST BASELINE CHANGES AUTHORIZED DURING REPORT PERIOD)													
GEN AND ADMIN													
UNDISTRIBUTED BUDGET													
PM BASELINE (END OF PERIOD)													
MANAGEMENT RESERVE													
TOTAL													

CONTRACTOR:		COST PERFORMANCE REPORT - MANPOWER LOADING												FORM APPROVED	
LOCATION:		CONTRACT TYPE / NO.:				PROGRAM NAME/NUMBER:				REPORT PERIOD:				OMB NUMBER 22R0280	
RDT&E <input type="checkbox"/> PRODUCTION <input type="checkbox"/>		FORECAST (NON-CUMULATIVE)												AT COMPLETION	
ORGANIZATIONAL OR FUNCTIONAL CATEGORY	ACTUAL CURRENT PERIOD	ACTUAL END OF CURRENT PERIOD (C/M)	SIX MONTH FORECAST BY MONTH						(ENTER SPECIFIED PERIODS)						
			(ENTER NAMES OF MONTHS)												
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
TOTAL DIRECT															

(ALL FIGURES IN WHOLE NUMBERS)

CONTRACTOR:		COST PERFORMANCE REPORT - PROBLEM ANALYSIS			FORM APPROVED
LOCATION		CONTRACT TYPE / NO.:	PROGRAM NAME/NUMBER:	REPORT PERIOD:	OMB NUMBER
RDTE <input type="checkbox"/>	PRODUCTION <input type="checkbox"/>				22R0280

EVALUATION

Section 1 - Total Contract: Provide a summary analysis, identifying significant problems affecting performance. Indicate corrective actions required, including Government action where applicable.

Section 2 - Cost and Schedule Variances: Explain all variances which exceed specified variance thresholds. Explanations of variances must clearly identify the nature of the problem, the reasons for cost or schedule variance, impact on the immediate task, impact on the total program, and the corrective action taken. Cost variances should identify amounts attributable to rate changes separately from amounts applicable to manhours.

Within this section, the following specific variances must be explained:

- a. Schedule variances (Budgeted Cost for Work Scheduled vs Budgeted Cost for Work Performed)
- b. Cost variances (Budgeted Cost for Work Performed vs. Actual Cost for Work Performed)
- c. Cost variance at completion (Budgeted at Completion vs. Latest Revised Estimate at Completion)

In addition to the variance explanations above, the following analyses are mandatory:

- a. Identify the effort to which the undistributed budget applies
- b. Identify the amount of management reserve applied during the reporting period, the WBS elements to which applied, and the reasons for application

Section 3 - Baseline: If the difference shown in block (7) on format 3 becomes a negative value or changes in value, provide:

- a. Procuring activity authorization for the baseline change which resulted in negative value
- b. The amount (by WBS element) used to adjust for unfavorable performance incurred prior to the baseline change
- c. The amount (by WBS element) added to budgets previously established for future effort. Explain reasons for the additional budget in the following terms:
 - (1) In-scope engineering changes
 - (2) In-scope support effort changes
 - (3) In-scope schedule changes
 - (4) Economic change
 - (5) Estimating change
 - (6) Unpredictable change
 - (7) Other (specify)
- d. The amount (by WBS element) for added in-scope effort not previously identified or budgeted

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10.(continued)

1. If C/SCSC are contractually required, Columns (2) through (11) will contain information developed by the contractor's system implemented in accordance with the definitions and criteria contained in DoDI 7000.2. If C/SCSC are not contractually required, the data elements in these columns will be negotiated using the definitions of 7000.2 for guidance.

(1) Col (2) and Col (7) - Budgeted Cost Work Scheduled: For the time period indicated, enter the budgeted cost for work scheduled in these columns.

(2) Col (3) and Col (8) - Budget Cost Work Performed: For the time period indicated, enter the budgeted cost for work performed in these columns.

(3) Col (4) and Col (9) - Actual Cost Work Performed: For the time period indicated, enter the actual direct and indirect costs for work performed without regard to ceiling. Applied costs are preferred, if available. In all cases, costs and budgets will be reported on a comparable basis.

(4) Col (5) and Col (10) - Variance - Schedule: For the time period indicated, these columns reflect the differences between Budgeted Cost for Work Scheduled and Budgeted Cost for Work Performed. For the current period, Col (5), this figure is derived by subtracting Col (2) (BCWS) from Col (3) (BCWP). For the cumulative to date Col (10), this figure is derived by subtracting Col (7) (BCWS) from Col (8) (BCWP). A positive figure indicates a favorable variance. A negative figure (indicated by parentheses) indicates an unfavorable variance. Significant variances will be fully explained in the problem analysis on Format 5.

(5) Col (6) and Col (11) - Variance - Cost: For the time period indicated, these columns reflect the differences between Budgeted Cost for Work Performed and Actual Cost for Work Performed. For the current period Col (6), this figure is derived by subtracting Col (4) (ACWP) from Col (3) (BCWP). For cumulative to date Col (11), this figure is derived by subtracting Col (9) (ACWP) from Col (8) (BCWP). A positive figure indicates a favorable variance. A negative figure (indicated in parentheses) indicates an unfavorable variance. Significant variances will be fully explained in the problem analysis on Format 5.

(6) Col (12) - At Completion - Budgeted: Enter the budgeted cost at completion for the WBS items listed in Col (1). This entry will consist of the sum of the original budgets plus or minus budget changes resulting from contract changes, internal replanning, and application of management reserves. The total should be equal to the negotiated contract cost plus the estimated cost of authorized but unpriced work except where special exception has been made (see paragraph 3.k.(7), above).

(7) Col (13) - At Completion - Latest Revised Estimate: Enter the latest revised estimate of cost at completion including estimated overrun/underrun for all authorized work.

(8) Col (14) - At Completion - Variance: Enter the difference between the Budgeted - At Completion (Col 12) and the Latest Revised Estimate at Completion (Col 13) by subtracting Col (13) from Col (12). A negative figure (indicated by parentheses) reflects an unfavorable variance. Significant variances will be fully explained on Format 5.

4. Format 2 - Functional Categories:

a. Col (1) - Organizational or Functional Category: Under this item list the organizational units or functional categories which reflect the contractor's internal management structure in accordance with Contractor/Government agreement. This format will be used to collect organizational or functional cost information at the total contract level rather than for individual WBS elements. The totals on this page should equal the Subtotal line on page 1.

b. General and Administrative: Enter applicable General and Administrative costs.

c. Undistributed Budget: Enter in Cols (12) and (13) the budget applicable to contract effort which cannot be planned in sufficient detail to be assigned to a responsible organization. The amounts shown on this format may exceed the amounts shown as undistributed budget on Format 1 if budget is identified to a task at or below the WBS reporting level, but organizational identification has not been made; or may be below the amount on Format 1 where budgets have been assigned to functional organizations but not to WBS elements.

d. Cols (2) through (14): The instructions applicable to these columns are the same as the instructions for corresponding columns on Format 1. (See paragraphs 3.1.(1) through 3.1.(8)).

5. Format 3 - Baseline:

a. Block (1) - Original Contract Target Cost: Enter the dollar value (excluding fee or profit) negotiated in the original contract. For a cost plus fixed-fee contract, enter the estimated cost negotiated. For an incentive contract, enter the definitized contract target cost.

b. Block (2) - Negotiated Contract Changes: Enter the cumulative cost (excluding fee or profit) applicable to definitized contract changes which have occurred since the beginning of the contract.

c. Block (3) - Current Target Cost: Enter the sum of Blocks (1) and (2). The amount shown should equal the current dollar value (excluding fee or profit) on which contractual agreement has been reached and should be the same as the amount shown as Negotiated Cost on Format 1.

d. Block (4) - Estimated Cost of Authorized, Unpriced Work: Enter the estimated cost (excluding fee or profit) for contract changes for which written authorization have been received, but for which contract prices have not been negotiated, as shown on Format 1.

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e. Block (5) - Contract Budget Baseline: Enter the sum of Blocks (3) and (4).

f. Block (6) - Total Allocated Budget: Enter the sum of all budgets allocated to the performance of the contractual effort. The amount shown will include all management reserves and undistributed budgets. This amount will be the same as that shown on the Total line in Col (12) on Format 1.

g. Block (7) - Difference: In most cases, the amounts shown in Blocks (5) and (6) will be identical. If the amount shown in Block (6) exceeds that shown in Block (5), the difference should be reflected as a negative value and explained in the narrative analysis on Format 5 at the time the negative value appears and subsequently for any change in the value.

h. Item

(1) PM Baseline (Beginning of Period): The time-phased performance measurement baseline which existed at the beginning of the current reporting period. All entries on this line are taken from the PM Baseline (end of period) line on the previous report.

(2) Baseline Changes: List by number, the contract changes and supplemental agreements authorized during the reporting period. All authorized baseline changes should be listed whether priced or unpriced.

(3) G&A: Enter the appropriate G&A costs applicable to current and future periods. If G&A is included in the baseline allocations shown above, enter G&A as a non-add entry.

(4) Undistributed Budget: Enter the total amount of undistributed budget as of the end of the reporting period.

(5) PM Baseline (End of Period): The time-phased performance measurement baseline as it exists at the end of the reporting period. The difference between this line and the PM Baseline (beginning of period) should represent the effects of the authorized changes and allocations of undistributed budget and management reserves during the reporting period.

(6) Management Reserve: Enter the total amount of management reserve remaining as of the end of the reporting period.

(7) Total: Enter the sum of the PM Baseline (end of period) and the G&A (if applicable) in Cols (2) through (13). Enter the sum of the PM Baseline (end of period), G&A (if applicable), management reserve, and undistributed budget in Col (14).

i. Col (2) - BCWS - Cum to Date: Enter the cumulative BCWS through the report period.

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j. Cols (3) through (13): Enter the projected BCWS (by month for six months and by other specified periods, or as negotiated with the procuring activity) for the remainder of the contract.

k. Col (14) - Total Budget: Enter the sum of the budgets allocated to the performance measurement baseline as of the beginning of the reporting period, plus the negotiated costs for authorized contract changes, the estimated costs for authorized-unpriced changes, the management reserve, the undistributed budget, and the G&A (if applicable). The total budget should equal the amount shown in Block (6) on this Format and on the Total line, Col (12) on Format 1.

6. Format 4 - Manpower Loading:

a. General: For those organizational or functional categories shown in Col (1) equivalent man-months will be indicated for the current reporting period, cumulative through the current period, and forecast to completion. Direct man-months will be shown for each organizational unit or major functional category for the contract. An equivalent man-month is defined as the effort equal to that of one person for one month. Figures should be reported in whole numbers. (Partial man-months, .5 and above, will be rounded to 1; below .5 to 0.) When mutually agreed by the contractor and the Government, manpower loading may be reported in terms of man-days or man-hours.

(1) Organizational or Functional Category: List the organizational or functional categories which reflect the contractor's internal management structure in accordance with Contractor/Government agreement. Categories shown should coincide with those shown on Format 2 of the report.

(2) Total Direct: The sum of all direct man-months for the organizational or functional categories shown in Col (1).

b. (Col 2) - Actual - Current Period: Enter the actual equivalent man-months incurred during the current reporting period.

c. Col (3) - Actual End of Current Period (Cum): Enter the actual equivalent man-months incurred to date (cumulative) as of the end of the report period.

d. Col (4) through Col (14) - Forecast (Noncumulative): Enter a forecast of manpower requirements by month for a six-month period following the current period and by periodic increment thereafter, such increment to be negotiated with the procuring activity. The forecast will be updated at least quarterly unless a major revision to the schedule has taken place, in which case forecasts will be changed for all periods involved in the report submitted at the end of the month in which the change occurred.

e. Col (15) - Forecast at Completion: Enter the estimate of equivalent man-months necessary for the total contract in Col (15) by organizational or functional category.

7. Format 5 - Problem Analysis Report: The Problem Analysis Report is a narrative report prepared to supplement the other pages of the Cost Performance Report as well as other reports which identify significant problems. The report should be prepared as specified on Format 5.

CONTRACT FUNDS STATUS REPORT (DOLLARS IN _____)

Form Approved
Budget Bureau No.: 22-RO180

Classification				Budget Bureau No.: 22-RO180										
1. CONTRACT NUMBER	3. CONTRACT FUNDING FOR FY	5. PREVIOUS REPORT DATE	7. CONTRACTOR (NAME, ADDRESS & ZIP CODE)		9. INITIAL CONTRACT PRICE: TARGET _____ CEILING _____									
2. CONTRACT TYPE	4. APPROPRIATION	6. CURRENT REPORT DATE	8. PROGRAM		10. ADJUSTED CONTRACT PRICE TARGET _____ CEILING _____									
11. FUNDING INFORMATION														
LINE ITEM/WBS ELEMENT a.	APPROPRIATION IDENTIFICATION b.	FUNDING AUTHORIZED TO DATE c.	ACCRUED EXPENDITURES PLUS UNLIQUIDATED COMMITMENTS TOTAL d.	CONTRACT WORK AUTHORIZED				FORECAST			TOTAL REQUIREMENTS l.	FUNDS CARRY-OVER m.	NET FUNDS REQUIRED n.	
				Definitized e.	Est. Over/Under Target Cost f.	Not Definitized g.	Subtotal h.	Not Yet Authorized i.	All Other Work j.	Subtotal k.				
12.		CONTRACT WORK AUTHORIZED (WITH FEE/PROFIT) - ACTUAL OR PROJECTED												
		ACTUAL TO DATE												At Completion
a. UNLIQUIDATED COMMITMENTS														
b. ACCRUED EXPENDITURES														
c. TOTAL (12a + 12b)														
13. FORECAST OF BILLINGS TO THE GOVERNMENT														
REMARKS:														

7000.10 (600.13)
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DATA ITEM DESCRIPTION		2. IDENTIFICATION NO(S).	
		AGENCY	NUMBER
1. TITLE Contract Funds Status Report (CFSR)		OSD	DI-F-6004A
3. DESCRIPTION/PURPOSE The Contract Funds Status Report (CFSR), DD Form 1586, is designed to supply funding data about Defense contracts to program managers for: (1) updating and forecasting contract fund requirements, (2) planning and decision making on funding changes in contracts, (3) developing fund requirements and budget estimates in support of approved programs, and (4) determining funds in excess of contract needs and available for deobligation. It compares current funding with (continued on page 2)		4. APPROVAL DATE December 15, 1972	
		5. OFFICE OF PRIMARY RESPONSIBILITY ASD(C)	
		6. DDC REQUIRED	
		7. APPROVAL LIMITATION	
7. APPLICATION/INTERRELATIONSHIP A. <u>Frequency and Submission.</u> Unless otherwise provided for in the contract, the CFSR will be required as of the end of each calendar quarter or contractor accounting period nearest the end of each quarter. The number of required copies of the CFSR will be forwarded to the Administrative Contracting Officer (ACO) within 25 calendar days after the end of the "as of date" of the report, or within the number of days specified in the contract. Under those exceptional circumstances described in Paragraph C.4., below, which call for increased frequency in reporting, such frequency will not exceed monthly reporting and will be specified in the contract or will be mutually agreed upon. The reports will be submitted within the number of days specified in the contract after the "as of date" of the report. (continued on pages 2 thru 4)		8. REFERENCES (Mandatory as cited in Block 10) MIL-STD-881 ASPR Section 3-404.2 Industrial Security Manual for Safeguarding Classified Information P.L. 85-804 DoD Instruction 7000.6 DoDI 7110.1 and DoD Manual 7110.1-M	
		MCSL NUMBER(S) 70934	
10. PREPARATION INSTRUCTIONS A. The Contract Funds Status Report will be a contractual requirement as set forth in the DD 1423 and DD 1660. The contractor shall prepare the Contract Funds Status Report, DD Form 1586, in accordance with the specific instructions listed below. A separate DD Form 1586 shall be prepared for each contract on a complete weapon/support system and/or major segments as specified in the contract. B. <u>Reporting Financial Data.</u> Data showing funding levels and estimated fund requirements will be entered in applicable columns in the same line as the WBS element/line item specified in the contract. Under those exceptional conditions described in Block 7, Paragraph C.1., which call for increased detail in reporting, data at the WBS element/line item level must be supported by data for items representing one lower level of detail. Data may be reported at the total contract level or by WBS element/line item as identified in column 11.a. of DD Form 1586. These data will represent the contractor's expected total funds requirement for the Fiscal Year(s) identified in Item 3, including G&A plus fee/profit. Total funds requirement will be estimated for all categories identified in the form for columns 11.c. through 11.h., excluding 11.f. Until such time as the contractor has received a Notice of Termination affecting the contract, all funding requirements will be based on the assumption that work on the contract will continue until completion. C. <u>Mechanized Data Submissions.</u> When a computer program is available for processing the required data, they may be submitted in mechanized form following procedures specified by the contracting DoD Component. Otherwise data should be submitted in the attached form. Where data are furnished for mechanized processing, narrative remarks should accompany tapes or cards and identify pertinent items to which they apply, and a (continued on pages 5 thru 11)			

DD FORM 1664

PAGE 1 OF 11 PAGES

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Continuation Sheet

3. Description/Purpose (continued from page 1)

estimated fund requirements and describes the relative firmness of requirements on which estimates are based. Reasons for changes in fund requirements are also explained.

7. Application/Interrelationship (continued from page 1)

B. Reporting on Multiple Appropriations. Where two or more appropriation sources are used for funding a single contract or WBS element/line item, contractors will segregate funds data by appropriation accounting reference as specified in contract instructions for such reporting or segregation.

C. Levels of Reporting

1. Contracts over \$500,000 in Value. If a contract is funded with a single dollar amount and does not contain line items, specified tasks or work breakdown structure (WBS) elements as defined in MIL-STD-881, the contractor will report on one line in this report for the total contract; if a contract contains line items, specified tasks or WBS elements which are specified as line items in the contract, such items, in addition to the total contract, may be specified for CFSR reporting regardless of how the contract is funded.

WBS elements/line items will be selected in accordance with the policy of the funding agency and specified in the contract by the program manager. Such WBS element/line item reporting normally will not be required for items funded for less than \$500,000, and in no greater detail than that required to support the categories used in preparation of annual budget calls or budget estimate tracking (Sections IV. and V. of the Budget Guidance of DoD Instruction 7110.1 and its implementing manual 7110.1-M).

2. Small Contracts. DoD Components will issue implementing instructions to provide for requiring a reduced level of reporting within the framework of CFSR for: (a) those small contracts which have a dollar value between \$100,000 and \$500,000, (b) Time and Material contracts, and (c) contractual effort where the entire CFSR report might not be required (e.g., no line item reporting, fewer than total data items in columns or heading). This reduced level of reporting may be extended to contracts larger than \$500,000 if the DoD Component does not desire the full report.

3. On repair/maintenance, refurbishing, and basic ordering agreement contracts requiring CFSR, the reporting breakdown will be as specified in the contract.

4. Increased Frequency and Levels of Reporting. Budget/management requirements may require data for specific WBS elements/line items at a more detailed level and with greater frequency than that identified in the contract. The selected circumstances under which such increased detail or frequency may be required will be solely in support of funds management requirements and tasks and will be described in the contract or will be subject to agreement. Such requirements may be continued until the contractor acknowledges that the approved funding is adjusted to meet increased requirements, e.g., if a WBS element/line item has a potential over target indicated, then fund requirements estimates may be necessary for subordinate WBS elements/line items (which may comprise a WBS element/line item but are not specified in the contract for CFSR reporting) until funds availability is adjusted to satisfy the increased fund requirement.

5. Reduction in Completion of Entire Report. The provisions of DoD Instruction 7000.6, "Acquisition Management Systems Control," allow for selection and application on contract (or portion of a contract) only those parts of a management system (such as the CFSR) essential to the management of each acquisition. In accordance with these provisions, the program manager should determine his needs for contract funds information and subsequently apply the entire CFSR or selected appropriate portions of the CFSR to his contract(s).

6. The contractor shall maintain data in his system to support the requirements listed above.

D. Additional Requirements

1. Appropriate information about the program for which contractor estimates are required (e.g., future year requirements not yet on contract but approved in the FYDP) and any specific limitations on the use of the forecast columns of the form (Items 11.1.-k.) shall be specified in the contract.

2. Following the delivery of the last item, a report marked Preliminary Final Report will be submitted as of the end of the quarter in which that item was delivered and accepted. A Final Report will be submitted at the end of the quarter during which contractor effort is completed.

E. Definitions

1. Unliquidated Commitments. For this report, a commitment is an incurrence of a firm obligation by the contractor, and the contractor's legal liability with regard to subcontracts, purchase orders, work in process, etc. Only those commitments which are outstanding (unliquidated commitments) on the "as of date" of the report are to be reported. (Note: Steps should be taken to assure that unliquidated commitments reported do not include progress payments to subcontractors.) Unless the contractor has received a Notice of Termination affecting the contract, unliquidated

commitments should be reported on the assumption that work on the contract will continue to completion. A report should include unliquidated commitments pertaining to the terminated portion of a contract only to the extent these are included in an estimate of the termination costs.

2. Accrued Expenditures. For this report, accrued expenditures represent charges incurred for goods and services received and other assets acquired, regardless of whether payment for the charges has been made. This includes all completed work and work in process chargeable to the contract. Accrued expenditures consist of invoices for (a) completed work to which the prime contractor has acquired title, (b) materials delivered (to which the prime contractor has acquired title), (c) services rendered, (d) costs billed under cost reimbursement or time and material subcontracts for work to which the prime contractor has acquired title, (e) invoices for progress payments to subcontractors which have been paid or approved for current payment in the ordinary course of business (as specified in the prime contract), and (f) fee/profit allocable to the contract.

3. Contract Over Target Cost. The amount by which the contract cost (actual or projected) exceeds the contract target cost (initial or adjusted) for work authorized in the negotiated contract.

4. Contract Under Target Cost. The amount by which the contract cost (actual or projected) is less than the contract target cost (initial or adjusted) for work authorized in the negotiated contract.

F. Exclusions from Coverage. This report will not be required on:

1. Firm fixed-price contracts as defined in ASPR 3-404.2 (except for unpriced portions of such contracts (e.g., spares, support equipment, publications, engineering change orders, etc.) that individually or collectively are estimated by the Government to be in excess of twenty (20) percent of the initial contract value).

2. All contracts with a total value of less than \$100,000.

3. All contracts expected to be completed within six months.

4. Facilities contracts.

With respect to item 1., above, the contract will delineate the specific CFSR requirements, if any, to be imposed on the contractor, to fit the circumstances of each particular case. In those instances where a contractor cannot segregate, without a major effort and/or change to his accounting system, the costs of engineering changes from all other costs, he should be permitted the flexibility to estimate costs of the engineering changes. The procedures used by the contractor in deriving estimates should be explained in the Remarks section of the report.

10. Preparation Instructions (continued from page 1)

printout should be included to expedite processing. When specified in the contract, the contractor will submit hard copy printouts from his punched cards or magnetic tapes in lieu of the DD Form 1586, provided that the printouts are identical in content and structure with the DD Form 1586. In the event that more than one DoD Component desires mechanized data processing from a single contractor, the DoD Components will provide the contractor with a uniform and mutually agreed upon set of data processing instructions.

D. Specific Instructions

Item 1: Contract Number. Enter the assigned contract number and the latest modification number on which a contractual agreement has been reached.

Item 2: Contract Type. Enter the type of contract as identified in ASPR, Part 4, Section III.

Cost Plus Fixed Fee (CPFF)
Fixed Price Incentive (FPI), etc.

Item 3: Contract Funding for FY. Enter the applicable type as specified in the contract as follows:

Multi-Year Procurement (MY)
Incrementally Funded Contract (INC)
Contract for a Single Year (SY)

For contracts which are financed with funds appropriated in more than one fiscal year, a report is required for each fiscal year's funds when the separate year's funds in the contract are associated with specific quantities of hardware or services to be furnished. The fiscal year(s) being reported will be shown in this block and that year's share of the total target and ceiling prices (initial and adjusted) will be shown in Items 9 and 10.

Item 4: Appropriation. Enter the appropriation and Service source in this block in accordance with the specific instructions in the contract.

Item 5: Previous Report Date. Enter the cut-off date of the previous report.

Item 6: Current Report Date. Enter the cut-off date applicable to this report.

- Item 7: Contractor. Enter the name, division (if applicable), and mailing address of the reporting contractor.
- Item 8: Program. Identify the program (if known) by name or enter the type, model and series or other military designation of the prime item or items purchased on the contract. If the contract is for services or a level-of-effort (research, flight test, etc.), the title of the service should be shown.
- Item 9: Initial Contract Price. Enter the dollar amounts for the initial negotiated contract target price and contract ceiling price when appropriate. For contracts which are financed with funds appropriated in more than one fiscal year, only the share of the total target and ceiling (initial and adjusted) associated with the fiscal year shown in Item 3 will be entered.
- Item 10: Adjusted Contract Price. Enter the dollar amounts for the adjusted contract target price (initial negotiated contract plus supplemental agreements) and adjusted contract ceiling price or estimated ceiling price where appropriate. For contracts which are financed with funds appropriated in more than one fiscal year, only the share of the total target and ceiling (initial and adjusted) associated with the fiscal year shown in Item 3 will be entered.
- Item 11: Funding Information.
- a. Line Item/Work Breakdown Structure (WBS) Element. Enter the line item/WBS element specified for CFSR coverage in the contract.
 - b. Appropriation Identification. Enter the appropriation number supplied by the DoD for each line item/WBS element.
 - c. Funding Authorized to Date. Enter dollar amounts of contract funding authorized under the contract to date through the report date shown in Item 6. On a report required for multi-year procurement, this item should contain funds applicable to the fiscal year(s) shown in Item 3.
 - d. Accrued Expenditures Plus Unliquidated Commitments Total. For contract work authorized, enter the total of (1) the accrued expenditures incurred through the end of the reporting period, and (2) the commitments outstanding (unliquidated commitments) on the "as of date" of the report.

For incrementally funded contracts, enter the total applicable to funds for the fiscal year(s) covered by this report as shown in Item 3.

On selected contracts, the separation of unliquidated commitments and accrued expenditures by line item/WBS element may be a negotiated requirement in the contract. Utilization of this waiver should be held to the minimum essential to support funding needs of the procuring agency. In the event this separation of data is not available in the contractor's accounting system or derivable without significant effort, provision should be made to permit use of estimates when such separation requirements are imposed. The procedures used by the contractor in developing estimates should be explained in the Remarks section of the report.

- e. Contract Work Authorized - Definitized. Enter the dollar value applicable to the time period (Item 3) reported for the contract on which contractual agreement has been reached. Amounts for changes will not be included in this item unless they have been priced and incorporated in the contract through a supplemental agreement to the contract. (For cost reimbursement type contracts, the reported dollar value will agree with the appropriate value listed in Item 10.)
- f. Contract Work Authorized - Estimated Over/Under Target Cost. Enter the dollar amounts for anticipated over/under target cost (initial or adjusted), for contract work authorized - definitized. Enter in Narrative Remarks: (1) a brief but complete explanation of the need for any additional funds even though the contractor has previously submitted a separate request; (2) information identifying the contractual sharing arrangement. Note: This is a non-add entry.
- g. Contract Work Authorized - Not Definitized. Enter the contractor's estimate of the fund requirements for performing required work (e.g., additional agreements or changes) for which firm contract prices have not yet been agreed to in writing by the parties to the contract. Report values only for items for which written orders have been received. For incentive type contracts, show net

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10. continued

dollar amounts (recognizing contractor participation).

- h. Subtotal. Enter the total of Items 11.e. and 11.g.
- i. Forecast - Not Yet Authorized. Report an estimate of fund requirements, including an estimated amount for fixed fee or profit, for changes proposed by the Government or by the contractor but not yet directed by the contracting officer. Clarify in the Narrative Remarks the change document number and estimated value of the change.
- j. Forecast - All Other. Enter estimated funds required for additional work anticipated to be performed (not included in a firm proposal) which the contractor, based on his knowledge and experience, expects to submit to the Government within a reasonable period of time.
- k. Subtotal. Enter the total requirements for forecast funding (the sum of Items 11.i. and 11.j.). Specific limitations on the use of the forecast funding section will be a part of the DoD Component supplementary instructions.
- l. Total Requirements. Enter the total requirements (gross) for contract work authorized and forecast (the sum of Items 11.h. and 11.k.).
- m. Funds Carryover. For incrementally funded contracts only, report the amount by which the prior Federal fiscal year funding was in excess of the prior year's requirement. If there is no carryover, report zero. Specific instructions for the use of this item will be made a part of the contract.
- n. Net Funds Required. Enter the net funds required, subtracting excess funds in 11.m. from total requirements in 11.l.

Item 12: Contract Work Authorized (With Fee/Profit) - Actual or Projected. Data entries will be actual to date in the first column and will be projected as of the end of each period covered by the column headings on the report. Data projections entered in columns 2 through 10 will represent either monthly, quarterly or fiscal year projections as prescribed by the funding agency.

As appropriate, projected data should include all appropriate allocations, anticipated accruals, anticipated over/under targets (net dollar amounts recognizing contractor participation), G&A, and fee/profit.

- a. Unliquidated Commitments. In the first column enter actuals to date and in subsequent columns enter the projected unliquidated commitments as of the end of each period covered by the column headings for the remainder of time in which contract work is authorized.
- b. Accrued Expenditures. In the first column enter actuals to date and in subsequent columns enter the projected accrued expenditures as of the end of each period covered by the column headings for the remainder of the time in which contract work is authorized.
- c. Total. In the columns provided, enter the total contract work authorized - actuals to date (column 1) or projected (columns 2 through 10). This total is the sum of unliquidated commitments and accrued expenditures through the periods designated by the column headings. The entry in the last completed column of this row (at completion) should be identical to Item 11.h. - Contract Work Authorized: Subtotal.

Item 13: Forecast of Billings to the Government. In the first column enter the cumulative amount billed to the Government through the current quarter, including amounts applicable to progress or advance payments. In succeeding columns enter the amount expected to be billed the Government during each period reported. Amounts will not be cumulative.

E. Narrative Remarks

1. A separate sheet will be used to submit any additional information or remarks which support or explain data submitted in this report. Information on "Changes," specified in these instructions will also be reported in the narrative. The System/Project/Program manager will assist the contractor in assigning change categories to assure the assignment of the proper category in relation to the total program.

2. General. The contractor will use the Remarks section of the Contract Funds Status Report to submit information regarding changes, as indicated below. A change in a line item will be

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reported when the dollar amount reported in Item 11.1. of this submission differs from that reported in the preceding submission. The movement of dollar amounts from one column to another (Items 11.e. through 11.k.), indicating a change in the firmness of fund requirements, need not be reported in this section. Change reporting should include the following:

- a. The location of the changed entry (page, line and column);
- b. The amount of dollar change;
- c. The coded identification of the cause (see classification below); and
- d. A narrative explanation of the cause of each change.

3. Change Categories. The contractor will use the categories shown in this paragraph for identifying the reasons for changing fund requirements. These categories identify two basic causes for changes in funds requirements - change in the scope of the system/project/contract (identified simply as "Scope" changes) and changes in the price with no change in the scope ("Price" changes). Categories will be used as shown unless the contractor is advised of specific alternatives through contractual channels. While the general intent in providing categories for use is that one category will describe one change, it is recognized that more than one category may be required in selected cases of changes in estimates of fund requirements. In such cases reporting contractors should identify changes using more than one change category and utilize the Remarks section to describe the circumstances of overlap or duplication. The reasons for change are broken down as follows:

a. "Scope" Changes. There are four categories for this class of reasons for change in estimates. Report total Funds Requirements changes (Item 11.1.) due to:

(1) Engineering Change. An alteration in the physical or functional characteristics of a system or item delivered, to be delivered, or under development, after establishment of such characteristics. Specific changes must be separately identified and quantified as to amount. Code A1.

(2) Quantity Change. A change in quantity to be procured, the cost of which is computed using the original cost-quantity relationships, thereby excluding that portion of the current price attributable to changes in any other category. Code A2.

(3) Support Change. A change in support item requirements (e.g., spare parts, training, ancillary equipment, warranty provisions, Government-furnished property/equipment, etc.). Code A3.

(4) Schedule Change. A change in a delivery schedule, completion date or intermediate milestone of development or production. Each change must separately be identified as Government responsibility or contractor responsibility and quantified as to amount. Code A4.

b. Price Changes. There are five categories for this class. Report Total Funds Requirements changes (Item 11.1.) due to:

(1) Unpredictable Change. A change caused by Acts of God, work stoppage, Federal or State law changes or other similar unforeseeable events. Unforeseeable events include extraordinary contractual actions under the authority of P.L. 85-804 except that formalization of informal commitments should be reflected under the other categories, as appropriate, and not included under this category. Code B1.

(2) Economic Change. A change due to the operation of one or more factors of the economy. This includes specific contract changes related to economic escalation and the economic impact portion of quantity changes not accounted for by the original cost-quantity relationships used to calculate cost-quantity change variance. This category also includes changing constant or current dollar amounts in program estimates to reflect (a) altered price levels, or (b) definitized contract amounts. Code B2.

(3) Estimating Change. A change in program or project cost due to refinements of the base estimate. These include mathematical or other errors in estimating, revised estimating relationships, etc. Excluded from this category should be revisions of cost estimates that occur because of other change categories, i.e., engineering, support, schedule, etc. For example, a cost change which occurs because of the addition of a new warhead is an engineering change, and not an estimating change; a revised production schedule is a schedule change, not an estimating change. Code B3.

(4) Contract Performance Incentives. A net change in contractual amount due to the contractor's actual performance being different than was predicted by performance (including delivery) incentive targets; as differentiated from cost incentive targets; established in a Fixed-Priced Incentive or Cost Plus Incentive Fee contract. This category also includes any changes in amounts paid or to be paid a contractor due to (a) award fee contract, or (b) the sharing provisions of a value engineering incentive clause included in any type of contract. Code B4.

(5) Contract Cost Overrun (Underrun). A net change in contractual amount over (under) that contemplated by a contract target price (FPI contract), estimated cost plus fee (any type cost reimbursement contract), or redeterminable price (FPR contract), due to the contractor's actual contract costs being over (under) target or anticipated contract costs, but not attributable to any other cause of cost growth previously defined. Offsetting profit or fee adjustments attributable to cost incentive provisions, if any, shall be considered in determining the net contract cost overrun (underrun). Code B5.

APPENDIX C

It is our opinion that although there are some unique difficulties, C/SCSC can be successfully implemented in the shipbuilding environment.

The enclosed information (pages 23-30) is provided to illustrate the information in Chapter V.

PROGRAM CONTROL

CONTRACT
MANAGEMENT

WORK
BREAKDOWN
STRUCTURE

LINE
MANAGEMENT

ORGANIZATION
BREAKDOWN
STRUCTURE

SHIP
CONSTRUCTION
& TEST
MANAGEMENT

SHIP
BREAKDOWN
STRUCTURE

X X
HULL

X X X
ACCOUNT

- X
TYPE
OF
WORK

X X X
SERIAL
NO.

X X X
DEPT.

X X X
UNIT

X X X X
AREA

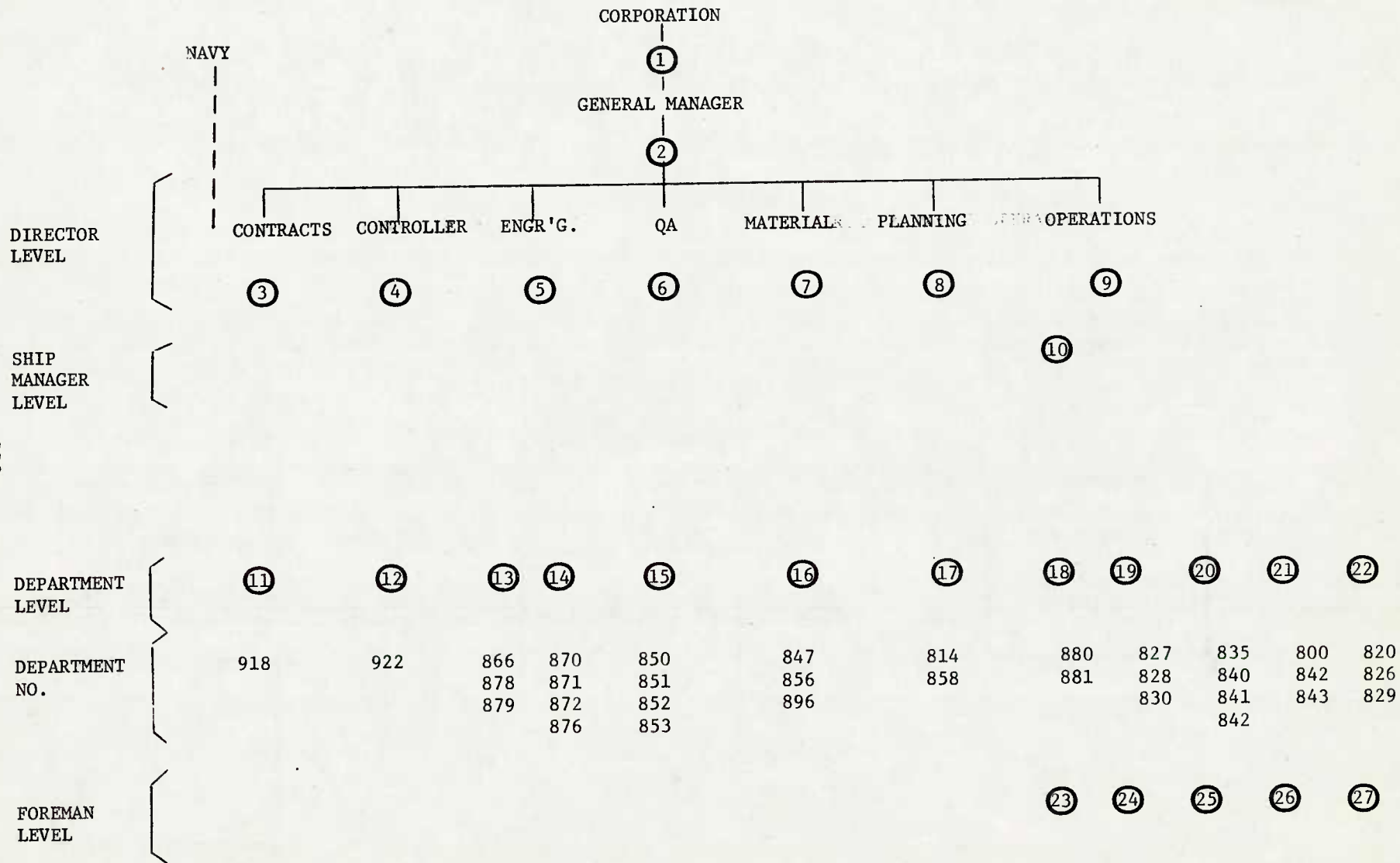
CONTROL
MEDIA

FUNCTION

WORK PACKAGE ALLOCATION NUMBERS

ALLOCATION, BUDGET, ACTUAL HOURS, SCHEDULED START & COMPLETE & ACTUAL START & COMPLETE

LEVELS AND POINTS OF CONTROL
THROUGH THE ORGANIZATIONAL CHAIN

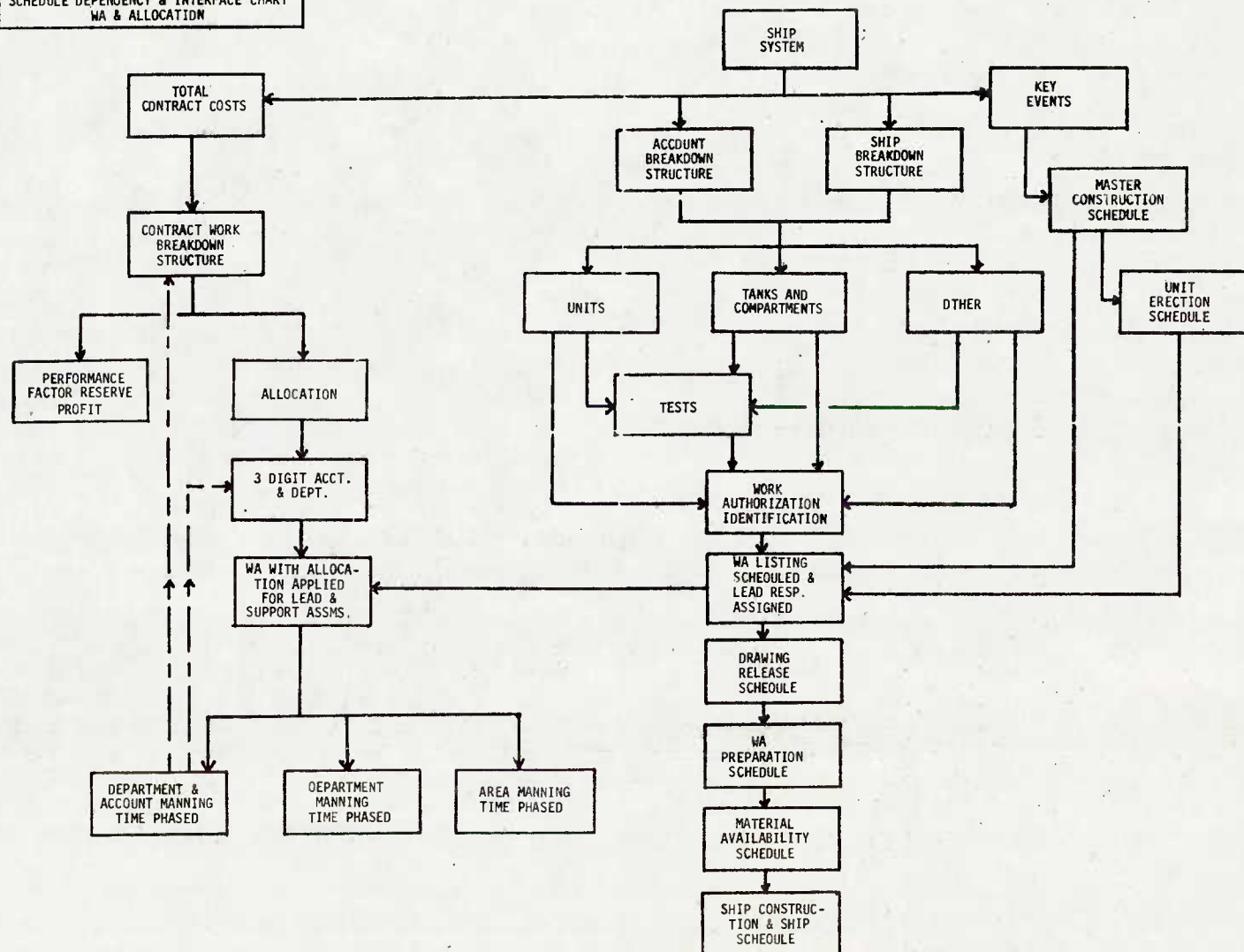


11 IDENTIFIES A CONTROL POINT

SHIP CONSTRUCTION & TEST PLANNING CYCLE

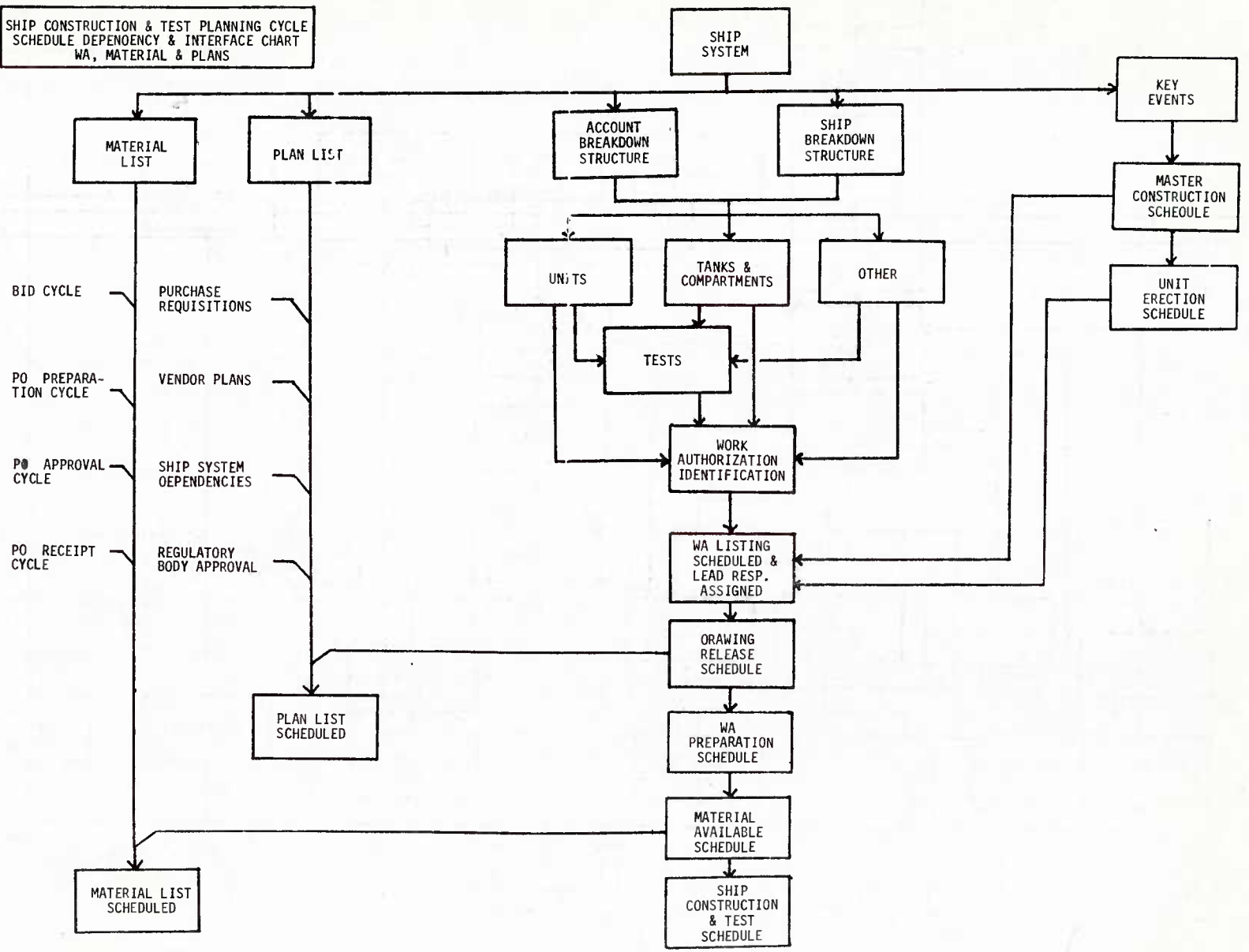
1. PREPARE MASTER CONSTRUCTION SCHEDULE.
2. PREPARE UNIT BREAKDOWN.
3. PREPARE HULL ERECTION SCHEDULE.
4. PREPARE WORK AUTHORIZATION SCOPE (START OF WA MASTER).
5. PREPARE WORK AUTHORIZATION TO WA INDEX.
6. PREPARE WORK AUTHORIZATION TO DRAWING INDEX.
7. PREPARE WORK AUTHORIZATION TO MATERIAL INDEX.
8. PREPARE WORK AUTHORIZATION TO SHIP BREAKDOWN STRUCTURE INDEX.
9. PREPARE WORK AUTHORIZATION TO COMPARTMENT/TANK INDEX.
10. APPLY ALLOCATION TO WA.
11. SCHEDULE WA.
12. PREPARE DEPARTMENT MANNING PLAN (ALLOCATION & PERFORMANCE X AEV).
13. TEST DEPARTMENT MANNING PLAN.
14. ADJUST WA SCHEDULE AS REQUIRED.
15. NEGOTIATE DRAWING RELEASE SCHEDULE AND ADJUST WA SCHEDULE.
16. APPLY MAS TO PURCHASE REQ'S - NEGOTIATE MATERIAL DELIVERY & ADJUST WA SCHEDULE - TEST MASTER CONSTRUCTION SCHEDULE, ETC.
17. PREPARE SHIP BREAKDOWN STRUCTURE MANNING (ALLOCATION X PERFORMANCE FACTOR).
18. ADJUST WA SCHEDULE AS REQUIRED.
19. REPEAT 12 THROUGH 14 THEN ADJUST 15 THROUGH 18 UNTIL SATISFACTORY.
20. ESTABLISH CONTRACT BASELINE.
21. PREPARE WA PAPER.
22. BUDGET WA PAPER.
23. CONFIRM SCHEDULE.
24. REVISE WA SCHEDULE AS REQUIRED.

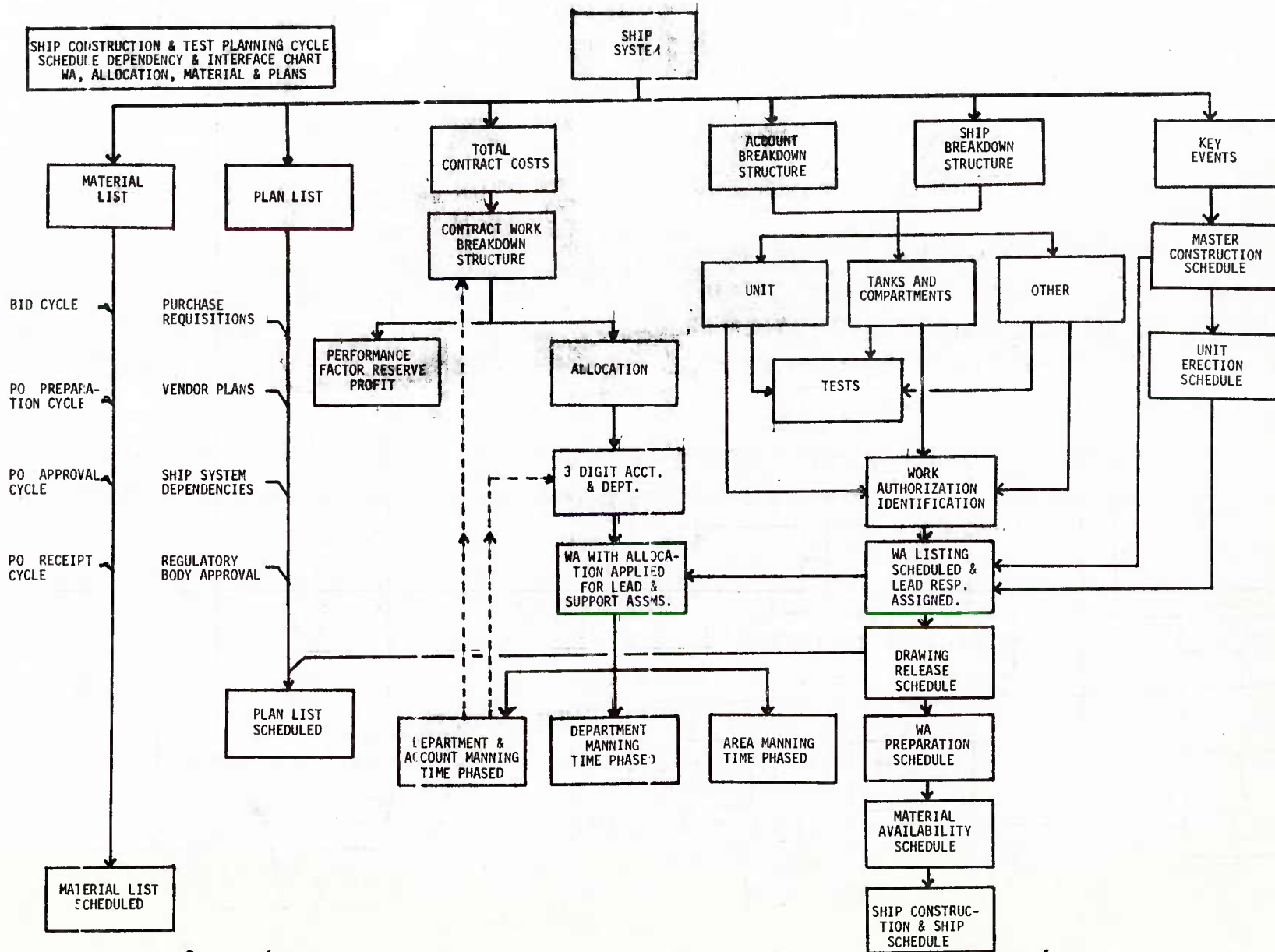
SHIP CONSTRUCTION & TEST PLANNING CYCLE
SCHEDULE DEPENDENCY & INTERFACE CHART
WA & ALLOCATION



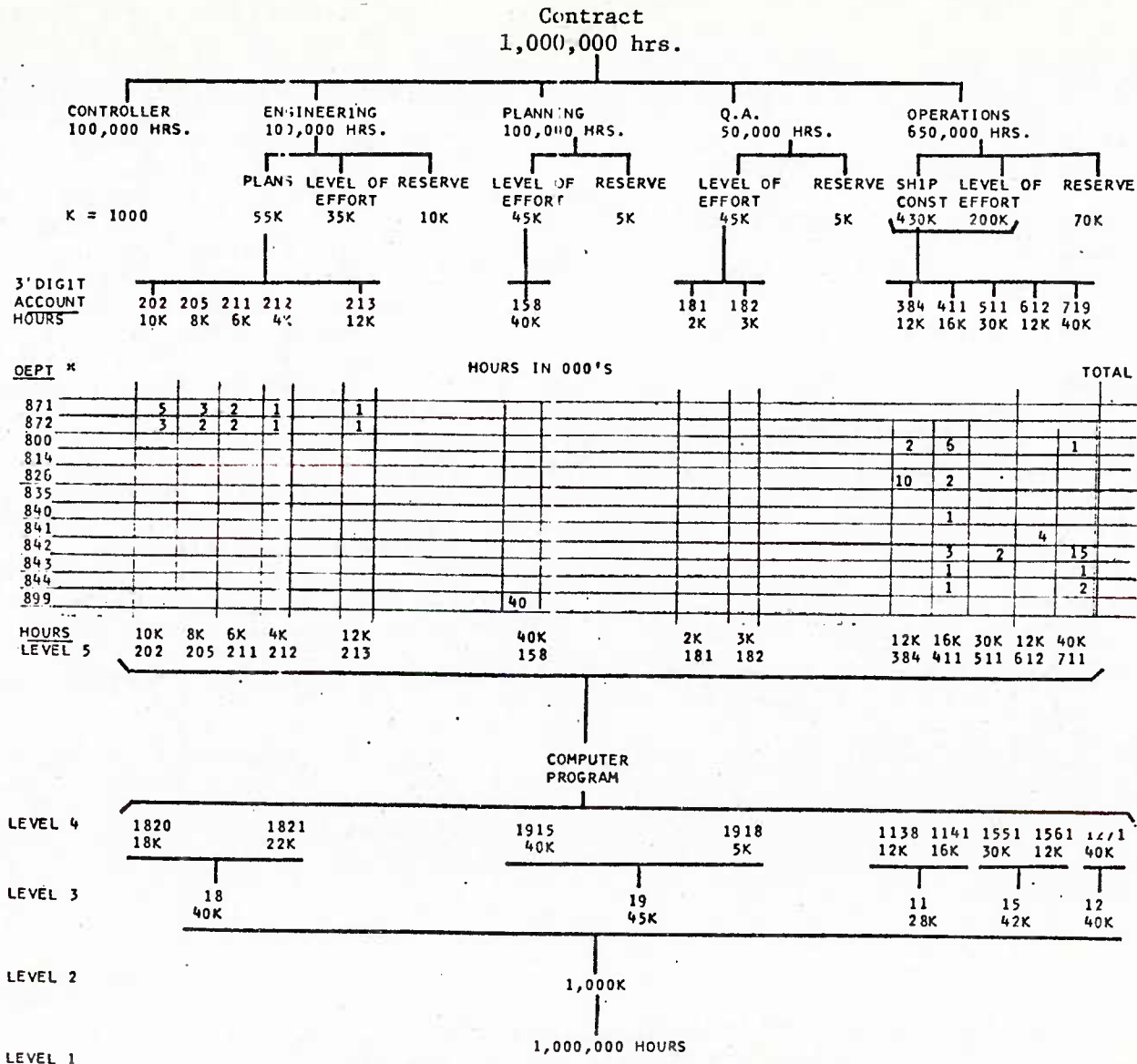
SHIP CONSTRUCTION & TEST PLANNING CYCLE
SCHEDULE DEPENDENCY & INTERFACE CHART
WA, MATERIAL & PLANS

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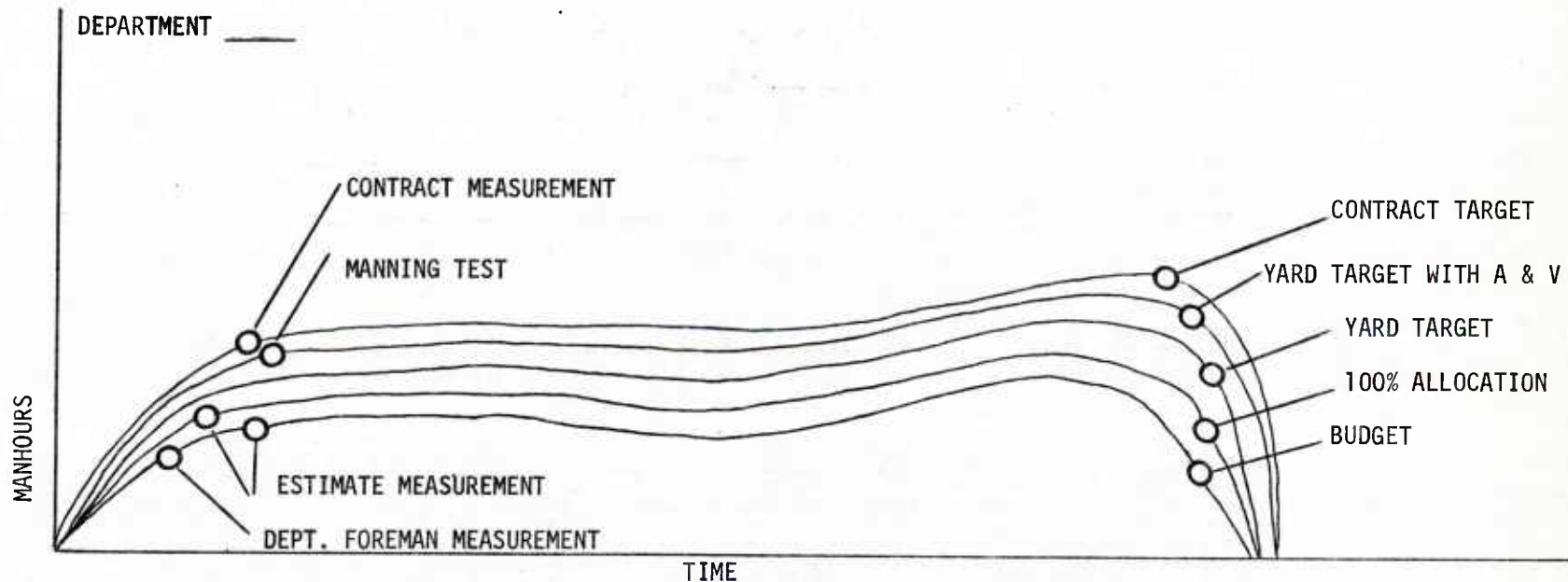
DIRECT LABOR HOURS ALLOCATION BY MAJOR FUNCTION TO THE 3 DIGIT ACCOUNT LEVEL



NOTE - THIS CHART SHOWS THE ALLOCATION OF HOURS DOWN TO THE DEPARTMENT LEVEL THROUGH THE PRESENT QUINCY 3 DIGIT ACCOUNT SYSTEM. THE ALLOCATION HAS BEEN DRIVEN BACK TO THE CONTRACT LEVEL THROUGH THE COMBINATION OF THE QUINCY 3 DIGIT ACCOUNT SYSTEM AND THE WORK BREAKDOWN STRUCTURE.

* LIST DOES NOT INCLUDE ALL DEPARTMENTS.

LABOR BASELINES FOR PLANNING & MEASUREMENT



DEFINITIONS

- BUDGET LABOR STANDARD APPLIED TO A SPECIFIC W.A. WITH PRECISE MATERIAL DEFINITION.
- ALLOCATION LABOR STANDARDS APPLIED TO CONTRACT MATERIAL TAKEOFF AT TIME OF BID ESTIMATE. THAT ALLOCATION IS THEN DISTRIBUTED TO THE WA'S BASED ON ANTICIPATED SCOPE.
- YARD TARGET DIVISION JUDGEMENT FACTOR APPLIED TO 100% ALLOCATION FOR THE PURPOSE OF DETERMINING MANNING REQUIREMENTS AND TESTING MANNING.
- WITH A & V AVAILABILITY AFTER APPLICATION OF A & V. ABSENCE AND VACATION.
- CONTRACT TARGET TOTAL HOURS AND COST OF THE CONTRACT INCLUDING ALL RESERVES AND PROFIT.

MEASUREMENT OF EFFORT

- DEPT, FOREMAN BUDGET TO ACTUAL
- ESTIMATE MEASUREMENT BUDGET TO 100% ALLOC.
- MANNING TEST YARD TARGET WITH A& V TESTED AGAINST MANPOWER AVAILABILITY
- CONTRACT MEASUREMENT CONTRACT TARGET TO ACTUAL

APPENDIX D

The Operating-Differential Subsidy

The Operating-Differential Subsidy (ODS) is designed to place American shipping companies on an operating parity with their foreign competitors. To accomplish this, the government pays to those American ship operators who request it and who agree to accept certain specified conditions, restrictions, and limitations, the difference between the cost of operating their vessels and the cost of operating the same type vessels in the same service under competitive foreign flags. To receive ODS, a shipper must agree to provide a specified level of service, using U.S. built ships and U.S. crews on a route which has been specified by the government as essential to the foreign trade and commerce of the U.S. Only vessels engaged in foreign liner service are eligible. As part of their ODS contracts the subsidized lines also must agree to build new ships to effect a continual modernization of the merchant fleet. The useful life for service on an essential trade route has been set at 20 to 25 years, and the ships then must be replaced with a U.S. - built ship.

**APPENDIX D OPERATING-DIFFERENTIAL SUBSIDIES
EXPENDITURES FOR THE FISCAL YEAR 1972 AND TOTAL
SUBSIDIES PAYABLE AND EXPENDITURES FOR THE PERIOD
JANUARY 1, 1937 TO JUNE 30, 1972**

Calendar Year	ACCRUALS			EXPENDITURES		
	Subsidies	Recapture	Net Payable	In Fiscal Year 1972	Cumulative through Fiscal Year 1972	Estimated Balance Payable
1937-46	\$ 48,725,478	\$ 32,695,537	\$ 16,029,941	—	\$ 16,029,941	—0—
1947	13,438,553	10,066,979	3,371,574	—	3,371,574	—0—
1948	28,077,303	13,794,768	14,282,535	—	14,282,535	—0—
1949	44,213,377	14,553,310	29,660,067	—	29,660,067	—0—
1950	57,874,056	9,265,433	48,608,623	—	48,608,623	—0—
1951	71,968,636	25,805,608	46,163,028	—	46,163,028	—0—
1952	89,361,880	26,108,608	63,253,272	—	63,253,272	—0—
1953	106,296,046	13,271,864	93,024,182	—	93,024,182	—0—
1954	107,357,156	1,069,909	106,287,247	—	106,287,247	—0—
1955	115,145,469	11,000,930	104,144,539	—	104,144,539	—0—
1956	128,189,900	25,483,596	102,706,304	—	102,706,304	—0—
1957	148,309,951	25,541,138	122,768,813	—	122,768,813	—0—
1958	147,008,266	6,336,805	140,671,461	—	140,671,461	—0—
1959	160,026,827	1,217,639	158,809,188	—	158,809,188	—0—
1960	167,895,154	5,176,231	162,718,923	—	162,718,923	—0—
1961	170,884,261	2,042,748	168,841,513	—	168,841,513	—0—
1962	179,748,676	4,947,848	174,800,828	\$ 578,409	174,470,225	\$ 330,603
1963	189,130,206	(1,388,903)	190,519,109	335,101	190,519,109	—0—
1964	207,995,171	674,506	207,320,665	3,480,520	207,320,665	—0—
1965	183,959,582	1,014,004	182,945,578	53,697	182,823,684	121,894
1966	202,927,949	3,229,471	199,698,478	1,301,426	199,603,898	94,580
1967	220,581,595	5,162,831	215,418,764	5,070,697	215,319,758	99,006
1968	222,770,873	3,673,790	219,097,083	9,190,776	218,981,725	115,358
1969	218,358,214	2,240,703	216,117,511	12,069,095	200,043,821	16,073,690
1970	214,530,065	(1,546,290)	216,076,355	16,173,233	199,727,608	16,348,747
1971	192,410,979	(2,821,289)	195,232,268	114,391,638	177,672,556	17,559,712
1972	93,252,681	—0—	93,252,681	73,022,229	73,022,229	20,230,452
TOTAL	\$3,730,438,304	\$238,617,774	\$3,491,820,530	\$235,666,821	\$3,420,846,488	\$70,974,042

BIBLIOGRAPHY

Government Documents

1. Army Regulation No. 1000-1. Basic Policies for Systems Acquisition by the Department of the Army. Washington: Headquarters Department of the Army, June 30, 1972.
2. Blue Ribbon Defense Panel, "Report to the President and the Secretary of Defense on the Department of Defense," Washington, D.C.: Government Printing Office, July 1, 1970.
3. Blue Ribbon Defense Panel. "Appendix E - Staff Report on Major Weapon Systems Acquisition Process," "Report to the President and the Secretary of Defense on the Department of Defense". Washington, D.C.: Government Printing Office, July, 1970.
4. U.S. Departments of the Army, Navy, and Air Force, Cost/Schedule Control Systems Criteria Joint Implementation Guide. Washington, D.C: Government Printing Office, March, 1972.
5. U.S. Department of Defense. Acquisition of Major Defense Systems. Department of Defense Directive 5000.1. Washington, D.C.: Department of Defense, April, 1972.

Cost Information Reports. Department of Defense Instruction 7041.2. Washington, D.C.: Department of Defense, June 13, 1966.

Cost Performance Report. Department of Defense Instruction 7000.10. Washington, D.C.: Department of Defense, January 3, 1973.

Performance Measurement for Selected Acquisitions. Department of Defense Instruction 7000.2. Washington, D.C.: Department of Defense, December 22, 1967.
6. Marella, L.S., The Effect of the Cost/Schedule Control Systems Criteria (C/SCSC) on Contractor Planning and Control. Washington: dissertation printed by the Defense Systems Management School, Ft. Belvoir, 1973.
7. U.S. Maritime Administration, "MARAD 1972 - A NEW WAVE IN AMERICAN SHIPPING. U.S. Department of Commerce 1973.
8. U.S. Maritime Administration, "Relative Cost of Shipbuilding in the Various Coastal Districts of the United States, U.S. Department of Commerce, June, 1972.
9. Williams, W.B. et al., Effectiveness of Contract Incentives, PRO Project 70-2. U.S. Army Procurement Research Office, August, 1970.

Books

10. Anthony, Robert N. Planning and Control Systems: A Framework for Analysis. Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1965.
11. Peck, Merton J., and Scherer, F.M. The Weapons Acquisition Process An Economic Analysis. Boston: Harvard University Press, 1962.

Unpublished Material

12. Clarey, Stephen S., Nix, Harvey W., and Waldron, Andrew J. General Dynamics Corporation, Harvard Business School Case 9-371-048.
13. ———. Shipbuilding in the United States, Harvard Business School Case 9-371-048.
14. Fox, J. Ronald, Address on Project Managers and Contractor Performance Measurement BEFORE AMC Project Managers' Conference. Washington, D.C., December 4, 1970.
15. ———. "Controlling an Ongoing Project Part 2 Contractor Performance Measurement." 1-673-019 Harvard Business School: The President and Fellows of Harvard College, 1972.
16. ———. Contract Changes, Harvard Business School Case 1-673-020, The President and Fellows of Harvard College, 1972.
17. Kemps, Robert R., LTC, USAF. "Approved C/SCSC Activities". OASD Comptroller Document, November, 1971.
18. ———. C/SCSC: "The DOD Cost/Schedule Control Systems Criteria". OASD (Comptroller) Briefing Paper, 1972.
19. ———. "Selected Acquisitions Information and Management System." OASD Comptroller Briefing Paper, January, 1972.
20. Reece, James S. "The Effects of Contract Changes on the Control of a Major Defense Weapon System Program." Unpublished Doctoral Dissertation, Harvard University Graduate School of Business, May, 1970.
21. Perry, Robert, et al., System Acquisition Strategies, R-733-PR/ARPA. The Rand Corporation, June 1971.

Periodicals

22. "Blue Ribbon Defense Panel Reports." Defense Industry Bulletin, September, 1970.

23. Divita, S.F. "Selling R & D to the Government", reprinted from Harvard Business Review, September-October 1965: pp. 62-75.
24. Fox, J. Ronald, "Funds Control Versus Costs Control." Army Log-istician. May-June, 1971, pp. 4-7, 38-39.
25. Kemps, Robert R. Major USAF. "Contractor Performance Measurement", Defense Industry Bulletin, Summer 1971: pp. 42-48.
26. Moot, Robert C. "Financial Environment of Defense." Defense Industry Bulletin, Fall, 1971.
27. "The Name of the Game is Management of Change". Armed Forces Management, October, 1969.
28. "Naval Construction", Marine Engineering Log/Yearbook, June, 1972.
29. "Navy Management Control Systems Philosophy", Naval Material Command Procurement Newsletter, Apr.-June, 1972.
30. "Navy Management Control Systems Philosophy", Naval Material Command Procurement Newsletter, July-September, 1972.
31. Shipbuilders Council of America, The 1971 Annual Report: Watergate, 1972.



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